MARCH 1991
ISSUE #366
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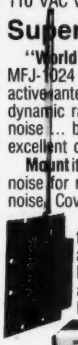

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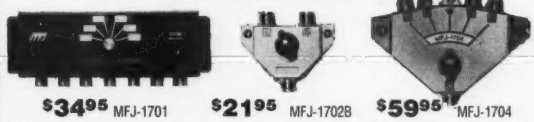

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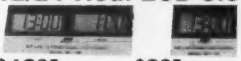

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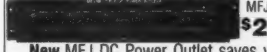

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LETTERS

From the Hamshack

Pat DA2AA, APO NY Besides the issues in the early 70s when you were harping on the IRS, the Nov. 90 issue was among the best I have ever read! Keep 'em coming. I still remember our eyeball QSO here in Wiesbaden in May 1980. I was the guy sitting in the front row smoking cigarettes and drinking beer. . . .

And you're still alive? . . . Wayne

Ben Bennett N7IVM, Bellevue WA I have just read "Never Say Die" in the December copy of *73*. As usual, when I read your column, I proceed cautiously, as I am never sure when something is going to leap out at me.

This time, however, I was unable to find any comments that I could disagree with. As usual, it seems as if the ARRL likes to start from behind the eight ball. The RSGB, of which I am also a member, has been working on this conference for at least three years, and they had no appeals for funds to help their effort. The inertia at the ARRL HQ is enormous, and I wonder whether you or I will live long enough to see much change. However, I am sure that that will not deter you.

Name withheld I've started writing some TV public service announcement spots that will target kids. As soon as they are finished, I'll pass them along for your input, and hopefully your support. I'd like these PSAs to be part of a larger campaign, with the spots serving to pique interest. Thanks for your encouragement. By the way, I spoke with some locals about this project and they thought that the ARRL should be the only ones to promote ham radio, that my ideas probably should be turned over to ARRL HQ, and that even if the spots were made, I'd never get them aired without ARRL endorsement (sigh). "Well," I replied, "if the ARRL wants to endorse them, great. If not, Who cares?" Wayne, I think you turned me into an unreasonable man.

How does the League manage to foster such complete idiocy? Your "locals" are certifiable nitwits . . . Wayne

Clifton Crews WD4MEI, Trussville AL Last night a neighbor of mine was in the shack. He is a CBer and a "sidebander." He is fascinated with packet and ATV, and is impressed with most of what he hears on 2m, but after listening to a little 75m phone, he said, "Man, on the lower side of 38 we wouldn't tolerate that kind of crap!" I almost split a side laughing.

I have listened in on some of his work on channel 38, LSB. It sounds like we all wish HF phone would sound. Well-behaved but slightly irreverent, interesting and well-done. This guy will make a fantastic ham without code . . . you see, he can't learn code. He's dyslexic, and code is just not in his brain's portfolio. All these years, he has been given the impression that he is not "good enough" to be a ham because of his inability to use code. I look forward to elmering him into a codeless Tech ticket, and working some ATV with him. He will be a better ham than most of the crotchety old guys crying doom and gloom.

Thaddeus A. Danley NZ3I, Eden Prarie MN I completely support the new code-free Technician license. Hopefully we will all work to welcome these new hams into the hobby.

Brett Breitwieser, Santa Cruz CA To celebrate the advent of the new no-code Tech license, I'm taking out a subscription to *73*. Thanks for the good work! I've been reading your mag for years. I'm 42 and a student of communications electronics at C.I.E., preparing for my radiotelephone op license. Now I'll get a new no-code Tech amateur's as well. Hope you will support the reality as you've supported the concept in the past.

This license is perfect for me since it's VHF/UHF I'm really interested in anyway, especially microwave. Let's get a bunch of new Techs and fill up those high bands before WARC! Would appreciate articles on proper procedures for new Techs and lots more VHF/UHF/microwave!

I see lots of signs of the usual stonewalling by the ARRL types on the computer nets and in the clubs. The new license is not for "real hams," it's a "boxtop license," etc. As though CW means anything anymore! Really laughable.

Let's make the new Tech license a real mark of distinction, real operator/builder/technicians opening up the microwave bands for the amateur community. Let's use the new license to juice up the amateur bands and help America regain its technological excellence.

Tuning the BBS: Ham #2 checks in on 2m after visiting ham #1 in intensive care. Ham #3 on the repeater asks, "How is he?" "Not too well. You should see all the tubes in him!" #2 says, "Gosh! All tubes. I didn't realize he was that old!" This brings a BBS response: That was shocking! Re-volting! Watt?!? At least that joke was current! *[They seem to use a lot of "!s" on BBSs.]* Another BBSer chimes in: We all take ohm-age to that joke. Do planar transistors sing "Ohm on the Range?" Where does the light go when it goes out?

Hmmm, bad as packet . . . . Wayne

A bad response to no-code from NØ Of course it was to be expected. Did anyone really think for a minute that the VHF bands wouldn't turn into a gigantic mess? And now that the feds have given 2m to the dogs, I hope that all of the no-code supports are feeling a bit like Judas. So much for saving 220 and 440, huh? Now all we need are repeaters set up exclusively for swapping recipes! Oh, well, there's always 10m FM.

To which a YL ham replies Excuse me? Going to the dogs? Swapping recipes? That's a sexist comment if I ever heard one. I'll have you know the examiner at my 13 wpm session said my copy was among the best he'd ever seen. I don't see how passing code is particularly more difficult than passing a 45-question written exam on theory. Depends on the person. If you listen to 14,313, those folks have all passed their code—many at 20 wpm! The problem with no-code isn't going to be people with a genuine interest in radio who did not like CW. The drawback will be people with an attitude problem who think that if they've passed a code exam that somehow makes them better operators than someone who hasn't. I hope you'll reconsider this CW bigotry.

Jonathan D. Armendariz, FPO San Francisco CA This letter is in response to your editorial in the Dec. '90 issue. It makes me glad that somebody has the same feelings I do. As an SWL, I passively listen to all the chaos going on, and it gets rather wild in my hometown (Los Angeles). I am not whining and crying, but as a prospective ham, is this what I have to look forward to? I want to be a ham because I love to communicate and make friends and hear from people of diverse cultures. However, if what I watch and listen continues, pretty soon there won't be much of anything left. Maybe the best we can do is to get together and try harder to think of some creative ways to get people interested, such as high school or college classes, new radio clubs, or maybe even a (GASP!) modified no-code license, something to get the young interested. Having the hobby dominated by old, closed-minded men shut to newcomers with new ideas, will cause its demise. All in all, wait till the ITU conference in 1992 and you'll see the shock on people's faces. After all, we are only hurting ourselves. I do appreciate the way you stand on your convictions, not being just another yes-man of the ARRL. I look forward to getting my ham ticket, but I'm concerned for what's ahead. *[This letter was written and answered before the FCC announced the new codeless license.—Eds.]*

If you'll notice—give it some thought—the worst mess on the air is coming from the least intelligent hams—chaps you don't want to waste a lot of time with anyway. Never mind 'em. Look for the hams with at least double-digit IQs and you'll do fine . . . . Wayne

Keith Baker KB1SF Soon after the FCC announced the long-awaited "codeless license," the following comments were heard on some local repeaters in the Dayton area: "Hate to see the code part go down the drain, we'll get all sorts of trash on the air now . . . Yes, maybe even them CBers . . . I suppose the bands will really be overcrowded now . . . Well, we can always go to 10 meters . . . They should give us regulars some new calls so we can tell us apart from them . . . There you go, they won't know beans about radio . . . ."

Count the number of "them's" and "they's" versus the "we's" and "us'es." These "concerns" about amateur radio have been around for years. I'm now firmly convinced we amateurs are afflicted with an almost universal phobia that ANYONE who enters the hobby AFTER ourselves is out to royally screw it up for those of US already here. I find it fascinating that WE weren't too concerned about these horrors when WE were trying to get our first tickets.

Face it: The real challenge facing amateur radio today is US! We talk about helping amateur radio grow. However, in our hearts, I believe many of us are doing our level best to erect barriers to keep THEM out. Have we ever stopped to think that THEM was US at one time? . . . Rather than erecting barriers for THEM, I suggest WE start making all our "growth" talk match our actions. How about becoming an elmer to one of THEM? When was the last time WE stopped by a Novice band to help a Novice or Tech with their code? When was the last time WE helped a newcomer put up their first antenna, or helped one of THEM set up their first shack, or answered THEIR questions about courteous operating practices? Who helped US get started in our hobby? Isn't it time WE returned the favor?

I suggest WE quit complaining, get off our collective finals, and start setting the example for our newcomers . . . before our new folks mistakenly assume the trash on 20 is the way it's supposed to be done! Inaction now may well seal the fate of our wonderful hobby. If we lose it, we'll only have US to blame!

Rick LaBrecque, Dixfield ME I recently passed my Novice and am diligently working toward Tech and General. I have an above average working knowledge of electronics, and feel each how-to article you print is great. Someone out there will say, "Boy, just what I was looking for," while the next guy will say, "Boy, I'd have to be a genius to build this gadget." We certainly can't please everyone.

What I would like to see is a Novice-Tech column EACH MONTH, with basics, such as learning code, building code oscillators, antennas, equipping the ham shack, proper grounding procedures. . . . I firmly believe that the Novice-Tech column is important, as is a General-Extra. . . . Not just a picture in the magazine showing kids or whoever just got their Novice ticket. Please talk this over, give it some thought, and keep it fresh in your mind, and keep it simple.

Rick, stay tuned. Wayne's got us working on a project that may be just what you're looking for . . . . David N1GPH

David N4YHC/AE, London KY Hello, I just thought I would send a quick note to tell you that I really enjoy your magazine. I have been getting it at the local bookstore.

Also, I wanted to say that I just passed Extra last night, exactly 364 days after I took my Novice test. I am 17 years old and a senior at my high school. I am one of three hams there. The other two are Techs.

I just wanted to tell you that the three of us are doing what we can to drum up some support for ham radio. Next week, we will be showing some video tapes and giving a brief talk in our physics class at my school. It seems that when everyone hears "radio," they think of channel 19 and that thing in their dashboard that puts out 100 dB. Anyway, we are doing what we can in our school paper to generate some interest.

David, I sure would like to see copies of what you're doing in your school paper . . . . David N1GPH

73 Amateur Radio Today

MARCH 1991
Issue #366

TABLE OF CONTENTS

FEATURES

9 Packet with the Microsats
The secrets of success..... KI6QE

12 Weather Satellite Reception
Dust off your unused scanner..... N6NHP

18 The Desert Voices Project
An overnight success story..... KA1UKM

21 Elementary Mode S
Satellite fun on 2.4 GHz—the easy way! KA9LNV

30 Touch-Tone Activated Scanner
So you won't miss a call! AA7Y

46 Two Meter EME Primer
Your guide to moonbounce action! W5UN

54 Hams in Space!
SAREX II, the next generation. ..... Chien

REVIEWS

36 The ICOM IC-970H VHF/UHF Multiband All-Mode Transceiver
A great rig for both satellite and local communications. .. KA7LDN

40 Skymoon
Software for EME communications. WA3USG

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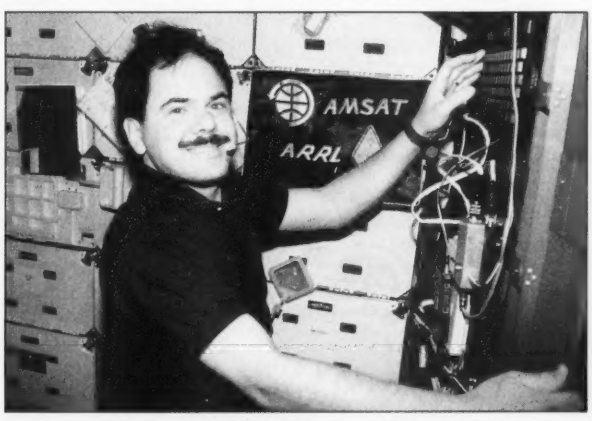
Cover: The launch of STS-35 SAREX II. Photo courtesy of NASA.



WA4SIR in space. . . see p. 54.

DEPARTMENTS

73 Above and Beyond
72 Ad Index
78 Ask Kaboom
76 ATV
70 Barter 'n' Buy
74 Circuits
85 Dealer Directory
80 DX
17 Feedback Index
77 Ham Help
75 Hams with Class
64 Hamsats
59 Homing In
2 Letters
4 Never Say Die
66 New Products
88 Propagation
68 QRP
7 QRX
88 Random Output
60 RTTY Loop
82 73 International
84 Special Events
86 Uncle Wayne's Bookshelf
83 Updates

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Wayne Green Enterprises is a division of International Data Group.

Reprints: The first copy of an article $3.00 (each additional copy—$1.50). Write to 73 Amateur Radio Magazine, WGE Center, Forest Road, Hancock, NH 03449.

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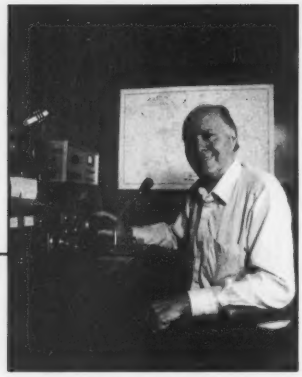
NEVER SAY DIE

Wayne Green W2NSD/1



Avoiding Cancer

The recent American Cancer Society report on the connection between animal fat and colon cancer was almost enough to get some Big Mac customers' attention. ACS president Dodd said, "Studies indicate that as many as 80% of all cancers may be related to the environment and things we eat, drink and smoke."

I suspect the good doctor is being conservative. Within a few years, if he doesn't smoke, I expect him to upgrade that to near 100%. I know I'm eating plenty of fiber, very little red meat, avoiding smokers, smog and magnetic fields. Of course I could still get shot by the Mafia for screwing up their investments in the music and magazine distribution businesses, but that's a health hazard I accept as a trade-off.

Sure, I like rare beef. Love it. But not enough to sacrifice several years of my life for the pleasure. I truly feel sorry for nicotine addicts who know they are devastating the last few years of their lives, but still are unable to stop smoking. They know it means cancer, heart trouble, emphysema, endless oxygen tank rentals and a nursing home, but even so the addiction is too overwhelming for them to stop.

The impact of magnetic fields, which is finally getting some media coverage, is almost enough to get you to re-read my old killer blanket editorials. Some blanket manufacturers are paralleling their heating wires to cut down the 60 Hz radiation, but that doesn't reduce the destructive thermostat switching transients. Have you bought comforters and wool blankets yet? Moved your linear away from the operating position yet?

It's still macho for college students to drink beer . . . the more they can drink, the more the macho. Other than death by highway, I don't know any way to discourage that age-old rite. Kids live and die for macho, just like men. When we can convince kids it's stupid to smoke and stupid to drink, we'll be progressing. Kids hate being stupid. It isn't cool. But how can we get the message across when dad, their prime role model, smokes two packs a day and tosses down a six-pack while watching ball games on TV every night?

Food is my addiction, so I know what it feels like to crave a fix. It calls for every shred of moral fiber I can muster to keep from overeating. Show me a delicious, luscious homemade apple pie and I'll show you a truly desperate man. Quitting smoking can't be much more difficult than breaking the eating habit. Oh, the torments! It isn't hunger. It's like the kitchen has this enormous magnet. Every time my guard is down it exerts this black-hole-like attraction.

It was 19 years ago I decided to hell with being fat. No pills, no canned diets . . . just a 1500 calorie a day diet and I took off 85 pounds at about ten pounds a month. I'd seen too many people drop dead from losing weight too fast, so I took it slow and easy. And I've kept it off pretty well. It can be done, even by a foodaholic like me.

Now stop grumbling about me trying to reform you. Sure, I know that most of you will get mad at me for butting into your life. But if even 1% have the guts to change, I'm willing to live with the hate. All I want you to do is live longer, healthier and happier. I want you to make enough money so it isn't a problem. And I want to do everything I can to keep amateur radio going so we can all both enjoy it and use it to help our country regain its industrial and financial strength.

Now, for you fatties . . . oh, I see you waddling around the Hamvention with your big fat guts hanging out over your belt. Here's how I lose weight. Breakfast I have a glass of fresh squeezed orange juice, a bowl of All-Bran with a banana and whole milk. Lunch is a bowl of oat bran with a half slice of English muffin toasted and a half grapefruit. Dinner I have a boiled quarter of cabbage (with a little butter), a chicken thigh and some spinach (or broccoli, kale, collard greens, turnip greens). I cook the thighs (all fat removed) with lots of onions in white wine (add some red pepper for heat) . . . mmmm . . . or broil 'em with curry powder on 'em. A little cranberry sauce spices it up.

Yes, I know, you thought you bought a ham magazine, not a health book. You'd prefer a nice big fried ham slice with candied (a little brown sugar) yams and a fried pineapple slice, right? Okay, but just on Friday night, then it's back to your diet. And don't gorge.

No snacks. No potato chips, Doritos or cheese balls. No beer. No Coca-Cola. You're drinking water now, and lots of it. Flush out that stuff which has been clogging your system for years. If you have to add something to the water, make it ice. Oh, okay, tea or coffee (decaffinated) is okay. Actually, green tea is supposed to be fantastic for you. I've got to get some.

You won't get hungry with that kind of diet . . . other than a psychic hunger. That's when you find out whether you or your own personal devil is stronger. It's "a" devil, not The Devil. He's busy down in Newington dancing with

Continued on page 61

QSL of the Month To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year Subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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Optional Accessories:
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"Dynamic Duals"

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TS-140S/680S

HF transceiver with general coverage receiver.

Compact, easy-to-use, full of operating enhancements, and feature packed. These words describe the new TS-140S HF transceiver. Setting the pace once again, Kenwood introduces new innovations in the world of "look-alike" transceivers!

- Covers all HF Amateur bands with 100 W output. General coverage receiver tunes from 50 kHz to 35 MHz. *(Receiver specifications guaranteed from 500 kHz to 30 MHz.)* Modifiable for HF MARS operation. *(Permit required)*
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- Famous Kenwood interference reducing circuits. IF shift, dual noise blankers, RIT, RF attenuator, selectable AGC, and FM squelch.
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- Selectable full (QSK) or semi break-in CW.
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- AMTOR/PACKET compatible!
- Built-in VOX circuit.
- MC-43S UP/DOWN mic. included.

Optional Accessories:
- **AT-130** compact antenna tuner
- **AT-250** automatic antenna tuner
- **HS-5/HS-6** headphones
- **IF-232C/IF-10C** computer interface
- **MA-5/VP-1** HF mobile antenna (5 bands) • **MB-430** mobile bracket
- **MC-43S** extra UP/DOWN hand mic.
- **MC-55** (8-pin) goose neck mobile mic.
- **MC-60A/MC-80/MC-85** disk mics.
- **PG-2S** extra DC cable • **PS-430** power supply • **SP-41/SP-50B** mobile speakers • **SP-430** external speaker
- **SW-2100** SWR/power meter
- **TL-922A** 2 kW PEP linear amplifier (not for CW QSK) • **TU-8** CTCSS tone unit • **YG-455C-1** 500 Hz deluxe CW filter, **YK-455C-1** New 500 Hz CW filter

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All-mode multi-bander

- 6m (50-54 MHz) 10 W output plus all HF Amateur bands (100 W output).
- Extended 6m receiver frequency range 45 MHz to 60 MHz. Specs. guaranteed from 50 to 54 MHz.
- Same functions of the TS-140S except optional VOX (VOX-4 required for VOX operation).
- Preamplifier for 6 and 10 meter band.

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features, and prices are subject to change without notice or obligation.

QRX . . .

EDITED BY LINDA RENEAU KA1UKM

Bill to Protect Amateur Radio

On January 3, Rep. Jim Cooper (D-TN) introduced H.R. 73, a bill to prevent the loss of radio spectrum by the Amateur Radio Service. Cooper is a member of the House Subcommittee on Telecommunications and Finance, where the bill is likely to be sent for consideration. H.R. 73 is also known as the Amateur Radio Spectrum Protection Act of 1991.

The legislation proposes that "the Federal Communications Commission shall not diminish existing allocations of spectrum to the Amateur Radio Service after January 1, 1991. The FCC shall provide equivalent replacement spectrum to the Amateur Radio Service for any frequency reallocation after January 1, 1991."

ARRL President Larry Price W4RA welcomed Rep. Cooper's support of the Amateur Radio Service and expressed the hope that many congressmen will join him as co-sponsors.

Says Cooper: "I've come to believe that amateur radio operators are a valuable national resource, and I hope to see that they keep the necessary radio spectrum to enable them to be around for many years to come."

Congress found that (1) there are more than 490,502 licensed amateurs in the U.S.; (2) the amateur operates with a solely personal, nonpecuniary interest; (3) one of the basic purposes of the amateur is to assist in emergency communications; (4) amateur radio operators have reliably provided emergency communications; and (5) the FCC has taken actions (see the next news item) which resulted in the loss of over 100 MHz of spectrum to amateurs. *TNX ARRL via MCImail; HAMNET; and* W5YI Report.

220–222 Battle Lost

The fight to keep the lower two megahertz of the 1.25 meter band from reallocation appears to be over, and ham radio has lost. On December 5, 1990, the U.S. Court of Appeals for the District of Columbia Circuit denied the ARRL petition for review of the FCC order reallocating 220–222 MHz to the Land Mobile Service. In rendering its decision, the Court concluded that by law it had to give great deference to the views of the Commission. It also stated that it could not say that the Commission did not arrive at a reasoned decision about the best way to advance the public interest, convenience, or necessity.

The ARRL and the amateur community have no other legal recourse open to them other than clear legislation by Congress. Editor Art Reis K9XI of *220 Notes* spoke with ARRL General Counsel Chris Imlay N3AKD, and learned that the appeals court was the last stop in the legal process. The FCC is now in the position to set a date when hams must vacate 220—222 MHz.

Meanwhile, UPS is going to have to share the "new" 220-222 MHz "land mobile" band with the military. The Army requested and was granted an experimental license permitting its use of the entire 1.25 meter band. The Army plans to conduct basic research in buried mine detection in the Arizona desert using 2.918 megawatt ERP transmitters and sensitive receivers mounted in helicopters. Loral Corporation has developed the new system and will be overseeing the tests under the callsign KA2XAV, which expires on May 1, 1992. The signal bandwidth will be 10 MHz with a 100 nanosecond pulsed CW duration.

Before the 1979 WARC, the military informed the FCC that it would not require access to the 1.25 meter band after January 1990. Recent developments in the Middle East may in part be responsible for the military's decision to retain access. The type of research, and the geographical conditions under which it is being performed, make this appear very likely. *TNX* Westlink Report, *Numbers 591, 592.*

U2MIR On the Air

Soviet Cosmonaut Musa Manarov U2MIR, one of the first operators who brought amateur radio to space two years ago, is back on the air from *Mir*. During his last tour of duty, lasting 366 days, he spent much of his free time operating primairly on 145.55 MHz simplex FM.

A new packet radio setup is now operational on *Mir*. You can connect to Musa's BBS by the command *C U2MIR-1* when he is not operating live packet on 145.55 MHz. Also included is a voice synthesizer to transmit bulletins in Russian, German, and English. The *Mir* station uses a higher power multi-mode amateur transceiver than the one in SAREX operations, and the antenna is mounted outside of the space vehicle. These two items, plus *Mir's* 51 degree orbital inclination, make U2MIR's station accessible to most hams worldwide. *TNX* Westlink Report, *Number 592, and N6BVU.*

WAC with 50 mW

After building the FIRE-BALL transmitter from the November '90 issue, Mike Mayer W5ZPA of New Orleans set out to work as many countries as he could on 10m. Using just 50 mW on 28.060 MHz, Mike worked all continents in under 10 days! He now has a total of 16 countries and 20 states, Included in his list was a contact with the ZS9Z DXpedition at Walvis Bay, proving that you don't need multikilowatts to work those rare ones! *TNX K7IRK and WA6YPE.*

Half a Billion Miles . . .

On September 27, 1990, a new record for low power communications was set. Bill Brown WB8ELK, operating from the W2NSD/1 ham shack at *73* headquarters, successfully copied a 2.89 µW CW message on 28.638 MHz transmitted by Bob Moody K7IRK in Palestine, Texas. Bob was using a keyed HP-608D signal generator hooked up to a 3-element beam. Based on a distance of 1502 miles, this works out to over 519 million miles per watt.

Young Speakers Wanted

Carole Perry needs good speakers and presenters under 18 years of age for the Dayton Hamvention this April. She will be presenting "Youth in Ham Radio." She also urges every ham to bring a nonham child or young person to the Hamvention. Carole's address is at the top of her column, "Hams with Class," in this issue.

Satellite News

AMSAT-OSCAR-10 is supporting Mode B transponder operations. Apparently it is receiving sufficient solar panel illumination. The transponder may be used *carefully* at all points of the orbit except MA 254-006 when eclipses occur. If beacon or transponder signals show signs of FMing, users should cease all transponder use immediately.

Both of Fuji-OSCAR-20's transponders, JA and JD, have been turned on by the command stations. It was determined that transponder operation has little effect on the internal battery temperature.

Since mid-August, FO-20 has been in a noneclipsing orbit, which means it has been constantly in sunlight. The battery temperature has risen to about 40°C. For normal operation, the battery temperature should be between 0 and 5 degrees. The command team for FO-20 will be monitoring the telemetry, and if they judge it necessary for the satellite's well-being, they may, without warning, turn off the transponders. *TNX* Westlink Report, *Number 591.*

TNX . . .

. . . to all our contributors. You can reach us by phone at (603) 525–4201, or by mail at *73 Magazine,* Forest Rd., Hancock NH 03449; and by e-mail on CompuServe ppn 70310,775, MCI Mail "WGEPUB" and the *73* BBS at (603) 525–4438 (300–2400 bps), 8 data bits, no parity, one stop bit.

QRX . . .

The SAREX STS-37 Mission

The STS-37 *Atlantis* mission, currently planned for early April 1991, will launch the Gamma Ray Observatory (GRO), the second of NASA's great observatories (the first was Hubble). Pilot Ken Cameron, a ham before becoming a NASA astronaut in 1984, is extremely enthusiastic about flying a SAREX experiment aboard his flight. He encouraged his fellow crew members to become hams, and all five astronauts now have their tickets.

The crew for the mission will be Commander Steve Nagel, pilot Ken Cameron, and mission specialists Jerry Ross, Jay Apt, and Linda Godwin. During the five-day mission that the crew will deploy GRO, Jay Apt and Jerry Ross will perform an EVA (ExtraVehicular Activity, or spacewalk) to evaluate Crew Equipment Translation Aids (CETA). These experimental space station "scooters" were designed to transport the astronauts from one portion of the structure to another, and to perform some mid-deck experiments, including SAREX. The SAREX STS-37 setup will use the same hardware and frequencies as the STS-35 setup, with the addition of amateur television.

On STS-37, live fast scan television (FSTV) will be uplinked from the ground on 70 cm. SSTV transmissions and reception to and from the shuttle will also be performed. NASA has been checking out a variety of portable home cameras for use aboard the shuttle. An 8mm Sony VCR/video camera will record the results from the mission's experiments. A Panasonic VCR/monitor, model PV-M429, will be used for slow and fast scan reception aboard the shuttle. The home model has been painted and wrapped in copper foil to reduce inflammability and EMI.

Since the Mir contact wasn't successful on the STS-35 mission, it will be a fairly important priority for STS-37. The crew's schedule may even be rearranged to make it possible.

Pilot Ken Cameron KB5AWP became an astronaut in 1984. STS-37 is his first shuttle mission. A Lieutenant Colonel in the Marines, he's clocked over 3,000 flying hours in 46 different types of aircraft. Since coming to NASA, he has worked on a Tether Satellite which will be launched next year. He's also worked on flight software testing, launch support at the Kennedy Space Center, and, appropriate for a ham, as CAPCOM (Capsule Communicator) for the STS-28 -29, -30, -33, and -34 missions. Besides ham radio, he enjoys flying, athletics, hunting, fishing, woodworking, and reading.

Commander Steve Nagel N5RAW first flew as a mission specialist on the STS-51-G mission in July 1985. Three satellites and a free-flying platform were launched. He was also a pilot on the German Spacelab D-1 mission, 61-A, in October 1985. Challenger's last mission, it carried a record eight people into space. When he flies as the commander of STS-37, he will become the first person to have flown aboard the shuttle in all three positions.

The all-ham crew of STS-37: Seated (l to r) are Ken Cameron KB5AWP, Steve Nagel N5RAW and Linda Godwin N5RAX. Standing (l to r) are Jay Apt N5QWL and Jerry Ross KB5OHL.

Mission Specialist Jerry Ross (who will be getting a new callsign) flew on *Atlantis*'s second mission, 61-B, in November 1985. The crew deployed three communications satellites and performed in-orbit drug manufacturing experiments. But the highlight of the flight was a spacewalk by Jerry and astronaut Woody Spring. They built two large, experimental tinkertoy-like structures for evaluating crew assembly procedures which may be used to build NASA's permanent space station in the future. Jerry's second mission was the *Atlantis* STS-27 secret defense department mission in December 1988 that deployed a radar spy satellite. By coincidence, Jerry closed the airlock hatch on the last U.S. spacewalk back in 1985, and he will open it back up on the next spacewalk, STS-37's CETA experiment.

Mission Specialist Linda Godwin N5RAX joined NASA in 1980 as a flight controller and payloads officer for several shuttle missions. Before joining NASA, Dr. Godwin, a rated private pilot, taught physics at the University of Columbia in Missouri and received several assistantships to conduct research in low temperature solid state physics. Selected by NASA in 1985, Dr. Godwin became an astronaut. She has worked with flight software verification, mission development, deployable loads, and Spacelab payload integration. STS-37 will be her first spaceflight.

Mission Specialist Jay Apt N5QWL worked for NASA's Jet Propulsion Laboratories in Pasadena, California, from 1980–82 in their Earth and Space Science Division as a scientist for the Pioneer Venus mission. In 1985, he became an astronaut. During his early days as an astronaut, one of Dr. Apt's jobs was to set up crew procedures for deploying and repairing GRO. He was lucky enough to get assigned to deploy GRO as his first shuttle assignment.

Compared to earlier shuttle ham experiments, STS-37 mission activities are more flexible. Since it isn't a Spacelab mission, the crew will wake and sleep at the same time, instead of working on different shifts. With a more relaxed schedule, the crew will have more time to take in the view, and hopefully, more time to operate SAREX. With an all-ham crew, it's possible that SAREX will be operated almost continuously in either voice or packet mode.

Based on a preliminary flight plan with an April 8, 1991 launch date at 14:14 GMT, the *Atlantis*'s orbital parameters will be:

Shuttle#	STS-37
Element Set	JSC-002
Epoch	91098.6250
Inclination	28.4632
RAAN	240.1995
Ecc	0.0006984
Arg Perigee	279.2831
Mean Anomaly	332.4544
Mean Motion	15.37981811
Decay Rate	2.3 E-04
Epoch Rev	1

TNX Phillip Chien. 73

See Philip's article "Hams in Space" in this issue.

Packet with the Microsats

The secrets of success.

by David Medley KI6QE

Many of us have had problems understanding the new microsat technologies and putting the hardware together to ensure success.

This is the account of one old ham who has achieved success through dogged determination and the old ham approach of trying something until you find out what works. Another approach is to ask an expert, but sometimes it's difficult to find the right expert. Here are some hints to help you get the most out of orbiting packet!

The specific equipment covered here is probably typical of many ham shacks. The transceiver is a Yaesu FT-736R with a PK-232 TNC, and a TAPR PSK modem and disconnect. The antenna system is a homebrew quagi driven by a Kansas City Tracker and an old IBM PC/AT.

Receive UO-11 Telemetry with your PK-232

This simple modification will allow you to copy the telemetry text directly from the University of Surrey's UoSAT-OSCAR 11.

UO-11 downlinks its telemetry via 1200 baud ASCII with an inverted bit format on 145.825 MHz FM. Reinhardt Richter DJ1KM came up with a modification to the PK-232 which will receive this format.

The modification consists simply of using an unused inverter in the PK-232. You install a small switch to move this in and out of the circuit. See Figure 1; the procedure is as follows:

1. Solder a jumper wire between U-15, pin 6, and U-15, pin 1.
2. Break the circuit board trace connecting U-15, pin 6, and JP-4 at "A."
3. Mount an SPDT switch on the front panel. The right-hand side above the power switch is suggested.
4. Connect the center of the switch to JP-4.
5. Connect one side of the switch to U-15, pin 2.
6. Connect the other side of the switch to U-15, pin 6.

When the newly added switch is in one position, the PK-232 will receive normally. When it's in the other position, all data received by the PK-232 modem will be inverted before reaching the 8530. This is essential for receiving UoSAT 11, and you will need to make some parameter changes to the PK-232 as follows: **MODE ASCII, ABAUD 1200, WIDE ON, MFILTER $80,** and **AFILTER ON.**

The AFILTER is only available in PK-232 units with the 1989 firmware. If your unit does not respond to the AFILTER command, just ignore it. It will still work fine with the UoSATS.

The TAPR PSK Modem

This sophisticated little unit comes from Tucson Packet Radio in kit form. Except for a few exceptions noted below, the instructions are well-documented and clear.

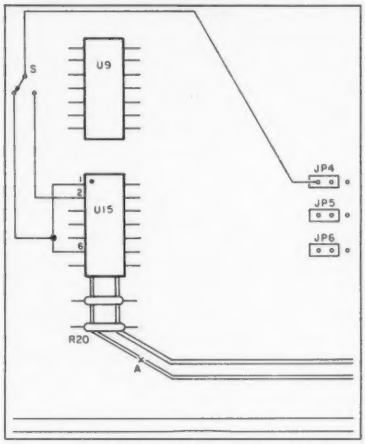

Figure 1. PK-232 modification for UoSAT-11 telemetry reception.

If you follow the instructions carefully, the unit should work. However, there are a few points to consider.

Because all the packet microsats use Manchester coding for the uplink, the left-hand switch on the modem must be "up" in the MAN position.

Next, the loop-back tests on page 40 of the instructions are merely to confirm that the Manchester circuitry is functioning. Do not infer from this test that the loop must lock at 9600 bps when receiving satellites. This is simply not the case; the loop always locks at 12.8 kHz when in the operational mode.

This misunderstanding is compounded by an error on page 41 of the TAPR instructions. The sixth instruction reads, "With a frequency counter at TP2, adjust R80 for a reading of 12.8 kHz." As R80 merely sets the internal clock in the modem, you can turn it all day without effecting the frequency at TP2!! If you substitute R33 for R80 in the instructions, all becomes immediately clear. Do not touch R80 under any circumstances once you have set it in accordance with the instructions on page 31.

If you are still having difficulties with these adjustments and loop-back tests, try changing the 4046 PLL chip at U-6. Of those tried, Motorola's 4046 chips have been the most successful. You can get them from JIM-PAKS, Radio Shack, or electronic parts supply houses.

When adjusting the AFC "dead band" as described on page 31, be careful to get this as accurate as possible. Remember that the FT-736 will track in 10 Hz steps, so you don't want the "dead band" to be too wide. 25–30 Hz has been found to be a good choice. For the FT-726, this needs to be wider to accommodate the 25 Hz steps. If the modem tracks with the tune indicator not centered, try small adjustments to R61 while copying live data from a satellite, and recheck the "dead band." Best operation is obtained when the TAPR modem loop is properly centered.

When wiring the modem, you'll be asked at specific points to decide whether your unit is a TNC-1 or a TNC-2. The PK-232 has the same clock arrangement as the TNC-1. Especially note page 23 of the instructions. Be sure the orange wire is connected to pad 2 if you are using a PK-232.

The interconnection cables are straightforward—if you can call putting on DIN connectors and 8-pin mike plugs "straightforward"!! Follow the instructions for the FT-726R on page 44 and be sure you make up the cable to connect between the modem TNC audio outlet and the PK-232 radio outlet. When completed, you should have the following connections:

1. From TNC Data to the modem disconnect.
2. From TNC Audio to the radio 1 (or 2) outlet on the PK-232.
3. From the VHF and UHF connectors on the modem, a single 6-conductor, shielded cable connecting to an 8-pin mike plug and a phone jack on the front of the FT-736. The connections for the 726 are similar.

When putting on these connectors, hold the connector body in a vice, as you need both hands free for the job. Avoid too much heat, which can damage the insulating material on the connectors. If you use the high-quality DIN connectors supplied by TAPR, the cable will fit tightly inside the rubber boot. A little petroleum jelly on the cable solves this problem nicely.

Before actually trying to receive live material off the air, it's useful to try the system out with an audio tape. You can get one from AMSAT at a modest cost.

The most useful is one which has AO-13

Microsat Frequencies

Microsat	Downlink	Uplink	Comments
UO-14 (UoSAT-14)	435.070	145.975	9600 bps FSK (FM) up & down 1200 bps AFSK (FM) up & down
AO-16 (PACSAT)	437.026	145.900	1200 bps BPSK (SSB) down
	437.051	145.920	1200 bps AFSK (FM) up with AX.25 Manchester encoding
	2401.143	145.940 145.960	
DO-17 (DOVE)	145.825 2401.22	None	1200 bps AFSK (FM)
WO-18 (WEBERSAT)	437.075 437.102	1265 ATV	1200 bps BPSK (SSB) down Fast Scan Video up
LO-19 (LUSAT)	437.125 437.126 437.154	None 145.840 145.860 145.880 145.900	CW Beacon 1200 bps BPSK (SSB) down 1200 bps AFSK (FM) up
FO-20 (Fuji-OSCAR)	435.910	145.850 145.890 145.910	1200 bps BPSK (SSB) down 1200 bps AFSK (FM) up

telemetry on one side and Fuji-OSCAR transmissions on the other. The AO-13 material is not germane to this discussion, but the Fuji material is of considerable value. Feed the output of the tape recorder directly to the phone plug on the cable going to the modem.

Fire up the PK-232 and you should be receiving FO-12 material without any trouble.

The Right Settings

Now we are ready to get on the air. The first thing to do is to re-configure some of the parameters in the PK-232. The following has been found successful: **DWAIT 32, FRACK 6, FULLDUP ON, HEADERLN ON, MAXFRAME 2, PACLEN 32, PACTIMINT 10,** and **TXDELAY 64.** On the TAPR modem, the left-hand switch is "up" or on MAN, and the next, center. Then the next is "up" or ON, and the right-hand switch is "up" or JOINT. Set the audio gain control on the radio so that the left-hand bar display on the modem is around the 7th or 8th bar. Tune in the microsat downlink until the right-hand bar display indicates that the loop is centered. (When you were adjusting the modem, you determined which bar would indicate this.) An oscilloscope connected to the PK-232 is a great help, and if you have a suitable one you might consider leaving it as part of the permanent installation. I use a Kenwood SM-220.

Put the loop-centered switch in the STEP switch to either USB or LSB, depending on your receiver tuning. Use whichever setting tracks correctly. The loop should remain centered throughout the satellite pass, and should not flicker either up or down. If it does, your "dead band" is too wide.

If all is well, you should now be receiving the downlink perfectly. First, try connecting to your station through either Pacsat or Lusat. For example, **KI6QE V** LUSAT-1. Keep the transmitter output to 20 watts or less, and use the FM-N position on the FT-736. If you are using an FT-726, be sure the deviation is less than 3 kHz. You should connect almost immediately. Be sure you are using the correct uplink frequency; see the table. You don't have to track the uplink frequency for Doppler since the microsat has sufficient bandwidth to compensate. However, if you are a purist, you may want to adjust the uplink frequency at the beginning, center, and end of the pass to maintain continuous connect.

Now you can try FO-20. First, tune in the downlink as before on 435.910 MHz, then try to connect with the Mailbox. Use the callsign 8J1JBS. Please note that there is no digipeater, so do not try to connect to yourself. It won't work. When you get the connect, wait for the prompt **JAS>**. If you issue a command before this, you'll get frame-reject responses, and you'll have to disconnect and start again. Pressing **H** will bring a short help screen, and you can go from there.

All these packet microsats have four uplink frequencies. You can select the appropriate uplink frequency in accordance with the following formula, suggested by HB9AQZ to avoid congestion on the uplinks: 1. If your callsign ends in a letter from A-G; 2. if your callsign ends in a letter from H-M; 3. if your callsign ends in a letter from N-T; and 4. if your callsign ends in a letter from U-Z.

Now, a word about the FT-736 radio. It has a small jack on the back that short-circuits most of the audio processing circuitry. This DATA IN/OUT jack is well worth using for the FM data input from the PK-232. Instead of connecting from the TAPR modem to pin 8 on the mike connector, take it to the sleeve of a miniature stereo connector and plug this into the above jack. Don't forget to include a ground connection as well.

You will be surprised at the improvement in your uplink performance. Connection is usually achieved at the first or second attempt, and through-put is as good as or, in many cases, better than with the local terrestrial BBS. You can even do better than this by taking this connection directly to the junction of R32 and C39 in the TX unit of the 736, but unless you are willing to get into your new and expensive radio with a soldering iron, I suggest that you forego this dubious pleasure, and put up with the "substandard" performance as described above.

The Software

A number of packages are available. Most of us start with a simple communications program, such as PC-TALK or PROCOMM, to interface the computer and the PK-232. This is adequate and flexible, but you have to set things up and remember key commands. PC-PAKRATT from AEA conveniently automates most of the functions you need, but it's hard to modify, and it hasn't been updated for the latest developments.

For example, if you want to use KISS or some of the newer commands, you have to resort to dumb terminal mode, which has no real advantage over the simpler communications programs above.

A newer shareware program called LAN-LINK retains most of the automation of PC-PAKRATT while keeping the flexibility of the simpler programs. You can obtain this from many BBSs and CompuServe.

The Quagi System

The installation described uses a dual home-brew quagi system with 2 x 9 elements on 2 meters, and 2 x 16 elements on 70cm with auto tracking, as already indicated. Others have obtained perfectly satisfactory operation with vertical antennas for both transmit and receive. If you choose to go this route, be prepared to put more RF power into the antenna; you'll need at least 100 watts EIRP. If reliable performance is your goal, experience indicates that perhaps 200 watts EIRP is a better figure.

Finally, what about all that neat telemetry that pours onto our screens? What does it all mean? It's a running commentary on the health of the satellite. There are programs to decode this data into more meaningful numbers. A program called TLMDC is available from some BBS facilities as well as from AMSAT. This decoder requires your PK-232 to be in KISS mode to operate properly. TLMDC takes binary data from the downlink and writes it directly to disk, or decodes it to the screen or another disk file. KISS is available on all PK-232 machines. However, if you don't have the 1989 firmware, you need to change the following parameters to get into the KISS mode: **KISS ON, HPOLL OFF, PPERSIST ON, RAWHDLC ON, CONMODE TRANSPARENT,** and **HOST ON.** If you have the 1989 firmware in your PK-232, all you have to do is type **KISS ON** at the CMD prompt.

As soon as you have entered these parameters, exit the communications program and bring up TLMDC by typing **TLMDC COM1:1200,n,8,1.** You will be able to see the actual telemetry in meaningful numbers.

Another program, WHATS-UP, is available from Joe Kasser G3ZCZ at P.O. Box 3419, Silver Spring MD 20918. It doesn't require KISS, having its own communications program, and it's probably the best way to go if you are just starting up.

There are two land-line BBSs which carry AMSAT news and the software referred to in this article. The official AMSAT board is operated by the Dallas Remote Imaging Group at (214) 394–7438. In Southern California, the California Astronomers Group has a section in their BBS, phone number (714) 738–4331, for AMSAT; it carries the same material as the Dallas BBS. I'd be more than happy to assist you with problems in similar systems; you can write to the address below, but please send an SASE with your request.

Since this article was first prepared some dramatic new developments have taken place in the Microsat World. Both LUSAT (LO-19) and PACSAT (AO-16) have new BBS software loaded and operating. To take advantage of these very advanced technology satellites you will need the following software packages in your ground station. These are obtainable from AMSAT.

PB.EXE This program allows you to copy broadcast bulletins, etc.

PG.EXE This allows you to get a file directory and to up and download files.

PFHADD.EXE This prepares files for uploading. You cannot upload without first using this utility.

PHS.EXE This processes downloaded files and allows you to display their contents.

It is important to note that PG requires your TNC to be in the TRANSPARENT mode, whereas PB requires KISS mode. This causes PK-232 users some inconvenience in switching from one program to the other whereas if you are using a TNC-2 this is not so.

This is a fast developing field so keep your eyes on the AMSAT Bulletin Boards. In particular, watch the 75-meter nets on Tuesday evenings on 3.840 kHz. 73

David Medley KI6QE was first licensed in Australia as VK3MJ in the '30s. He emigrated to this country with his family in the early '60s to work for the Collins Radio Company in Dallas, Texas. He retired in 1987. You may contact him at 1450 Bayview Heights Drive, Los Osos CA 93402. Again, please include an SASE.

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- Available for the 2M, 220MHz, 440MHz, 902MHz bands. ***FCC type accepted*** *(vhf and uhf commercial bands).*
- **Rugged exciter and PA**, designed for continuous duty.
- Power output 15-18W (25W option) on 2M or hi-band; 15W on 220MHz; 10W on uhf or 902MHz.
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- **Six courtesy beep types**, including two pleasant, sequential, multi-tone bursts.
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- The cwid message, dtmf command codes, and owner-specified default parameters for cor and cwid timers and tones are burned into the eprom at the factory.
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- Color coded led's **indicate status** of all major functions.
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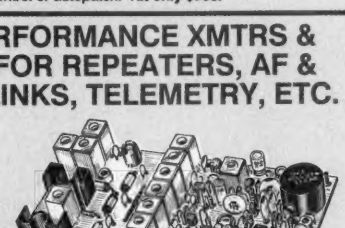

- **TA51** for 2M, 150-174, 220MHz.
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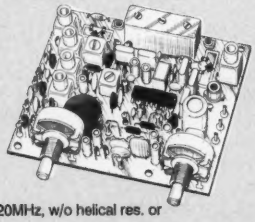

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- **R137 WEATHER SATELLITE RCVR** for 137 MHz. Kit $129, w/t $189.

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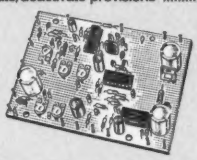
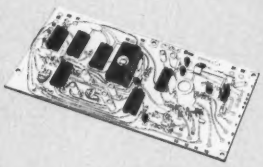
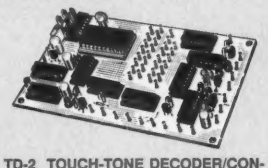


COR-3 REPEATER CONTROLLER kit. Features adjustable tail & time-out timers, solid-state relay, courtesy beep, and local speaker amplifier $49

CWID kit. Diode programmed any time in the field, adjustable tone, speed, and timer, to go with COR-3 .....$59



COR-4 kit. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call $99



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ONLY **$59** wired/tested

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- **Stable:** low-feedback dual-gate FET

**Specify tuning range: 26-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 800-960 MHz.*

LNW-(*) MINIATURE GaAs FET PREAMP

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LNS-(*) IN-LINE PREAMP

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CIRCLE 57 ON READER SERVICE CARD

Weather Satellite Reception

Dust off your unused scanner.

by John E. Hoot N6NHP

A number of years ago I became interested in receiving images from weather satellites. There are plenty of articles on this topic, and manufacturers of inexpensive computer systems for displaying vivid Earth images, but few tips on receiving the birds. After reading some of the NASA and NOAA specifications from the satellites, I concluded that none of my current gear was going to be satisfactory.

Photo A. With a little work, you can modify a used scanner to pick up the weather satellites.

Circumpolar Satellites

Polar orbiting satellites broadcast FM signals on frequencies between 137 MHz and 138 MHz. The problem for me was that these satellites have a total deviation of 30 kHz. Then, add to this, ±3 kHz of Doppler and transmitter stability guaranteed to about ±3 kHz. I figured I needed an IF about 42 kHz wide to do the job.

The calculated IF bandwidth meant that my NBFM receivers would be badly over-deviated. Any signal audio would be badly distorted and break up. With WBFM equipment, the weak signals would be lost in the noise. Despite the analysis, my curiosity led me to set my NBFM scanner to listen for the satellites.

As my analysis predicted, when I got the signal, it was over-deviated. The brighter the image transmitted, the higher the modulation index and the noisier the signal. But there was enough promise in that to get me thinking.

IF Discovery

I tuned a better receiver up to the same frequency, and to my surprise, the audio was worse. After some reflection, and a little time with a scope on the bench, I had the answer. The sharper IF filters in the good radio were attenuating the wide signal more than the cheap scanner I used initially. I sat down with a block diagram of the scanner to see what I could do to widen the IF for weather satellite work. The problem turned out to be pretty easy to solve. I discovered that with a little work, most synthesized scanners can be modified to perform well as weather satellite receivers.

Figure 1 shows how most modern, keyboard programmable NBFM scanners have been designed. You can often pick up a working unit at a swap meet for under $75. A new unit may only set you back $125. And, as I indicated, it only takes a little work to make it perform as well as dedicated satellite receivers that cost five to ten times as much. It's best to convert a lower-cost scanner with just NBFM capability since the more expensive units already have wideband FM (although they are too wide) and will not perform well after modification. If your scanner already has wideband FM capability, just add a good preamp for reasonable performance.

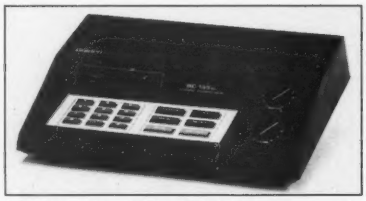

Photo B. The Uniden BC-145 scanner modified for weather satellite receive.

The Scanner Modification

Most scanners are dual-conversion receivers. They have two RF front ends: one dedicated to UHF reception and the other to VHF reception (see Figure 1). After the RF stages, both signals are mixed with signals from the PLL-controlled oscillator to produce a 10.7 MHz IF signal.

Using an analog multiplexer, the microprocessor selects which of the mixer outputs to feed through to the rest of the receiver. Since we are only interested in 137 MHz signals, we only need to worry about the VHF section.

Typically, the scanner uses a simple crystal filter at 10.7 MHz. Check the specifications of your unit's filter; refer to the part number. Most of these crystals are designed for WBFM gear, so they will have a 3 dB bandwidth of ±120 kHz. As long as the filter has a bandwidth of ±25 kHz or more, you won't need to replace it. If you do have to replace it, you can easily find a replacement in a junk FM broadcast receiver or you can order one from an electronic supplier for a few dollars. Suitable units include Tokyo America SM07M3-A0-20 from Digi-Key for $2.10.

After the first IF, the receivers will have a second local oscillator that will mix the 10.7 MHz down to 455 kHz. After the second mixer, you'll find a 455 kHz ceramic lattice filter. This component narrows the bandpass of the FM. These filters typically are ±10 kHz with very sharp skirts. If the first IF crystal filter is narrow enough, this filter can be removed and replaced with a small value (0.01 µF) bypass capacitor. Alternatively, you may wish to replace it with a wider ceramic filter. Suitable units include MuRata Erie CFM455A for about $13.

As a specific example, I've modified a Uniden BC-145 scanner. The 455 kHz ceramic filter is a Murata SFR-450D. It's an orange colored device labelled "part number FT-2," sitting next to the MC3359P IC. I removed this filter and replaced it with the 0.01 µF capacitor as shown in Figure 2. If you have trouble finding which are the in and out leads for you filter, just trace the leads from pins 3 and 5 (input and output) of the MC3359P.

Sweeping Up

Once you have replaced or bypassed the second IF filter, you will need to realign the

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Whether you're an expert or a novice, The Morse Machine has three ways to help you improve your code:

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CIRCLE 65 ON READER SERVICE CARD

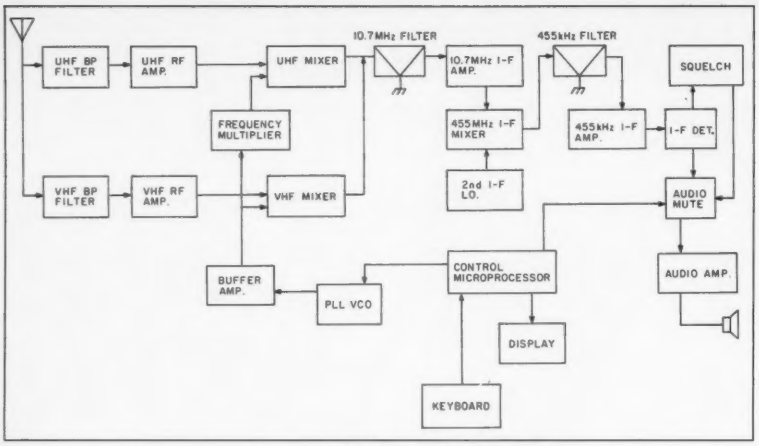

Figure 1. Generic FM scanner block diagram.

receiver. If you have a sweep generator, you can set the bandwidth to ±22 kHz, and adjust the IF transformers for flat response over the new passband.

If you don't have a sweep generator, do not despair. Get a 2 meter handheld and run it into a dummy load near the scanner. Since every scanner I have seen that covers 137 MHz FM also covers 2 meters, you can use the HT as a signal generator. Program the handheld in kHz steps to 144.500 MHz through 144.550 MHz. Stepping through the memories while transmitting is nearly as good as a sweep. You do not even need a scope. An RF voltmeter or oscilloscope connected to pin 5 of the MC3359P is good enough for the alignment. Again adjust the IF for a flat response across the desired passband. In the case of the Uniden BC-145, just tune L5 and L6 in the first IF stage slightly until you achieve the desired bandwidth.

After the adjustment, you should find that the satellites give good clean signals throughout their passes. Also, the scanner still functions reasonably well with NBFM signals, since a strong signal will force out adjacent signals.

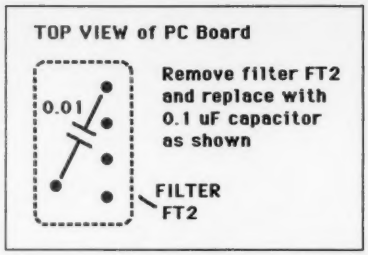

Figure 2. Pinout of the Murata SFR-450D filter showing the in and out pins. Remove the filter and replace with a 0.01 µF capacitor where shown.

You can also receive WEFAX from GOES and METEOSAT geostationary weather satellites by using a converted scanner with a 1691 MHz to 137 MHz downconverter.

If you're tired of listening to police calls, or have a dusty scanner lying around, put it to a new use. Spend an hour on this project, and be ready to chase down some impressive satellite images. [*Ed. Note: A completely modified and aligned Uniden BC-145 scanner as well as a lineup of IBM PC interfaces and programs for FAX, RTTY, SSTV and weather satellite receive are available from the author.*] 73

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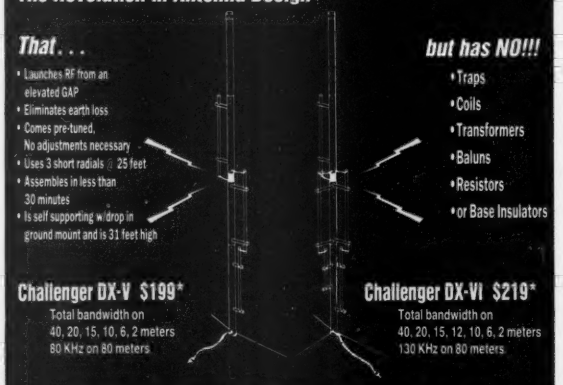
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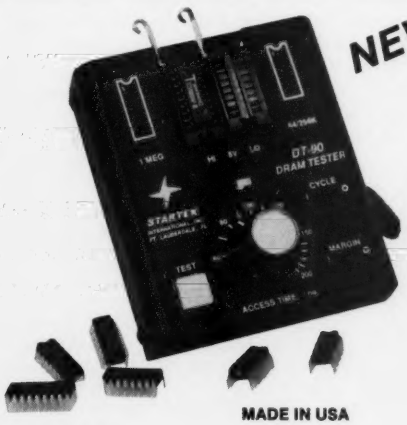

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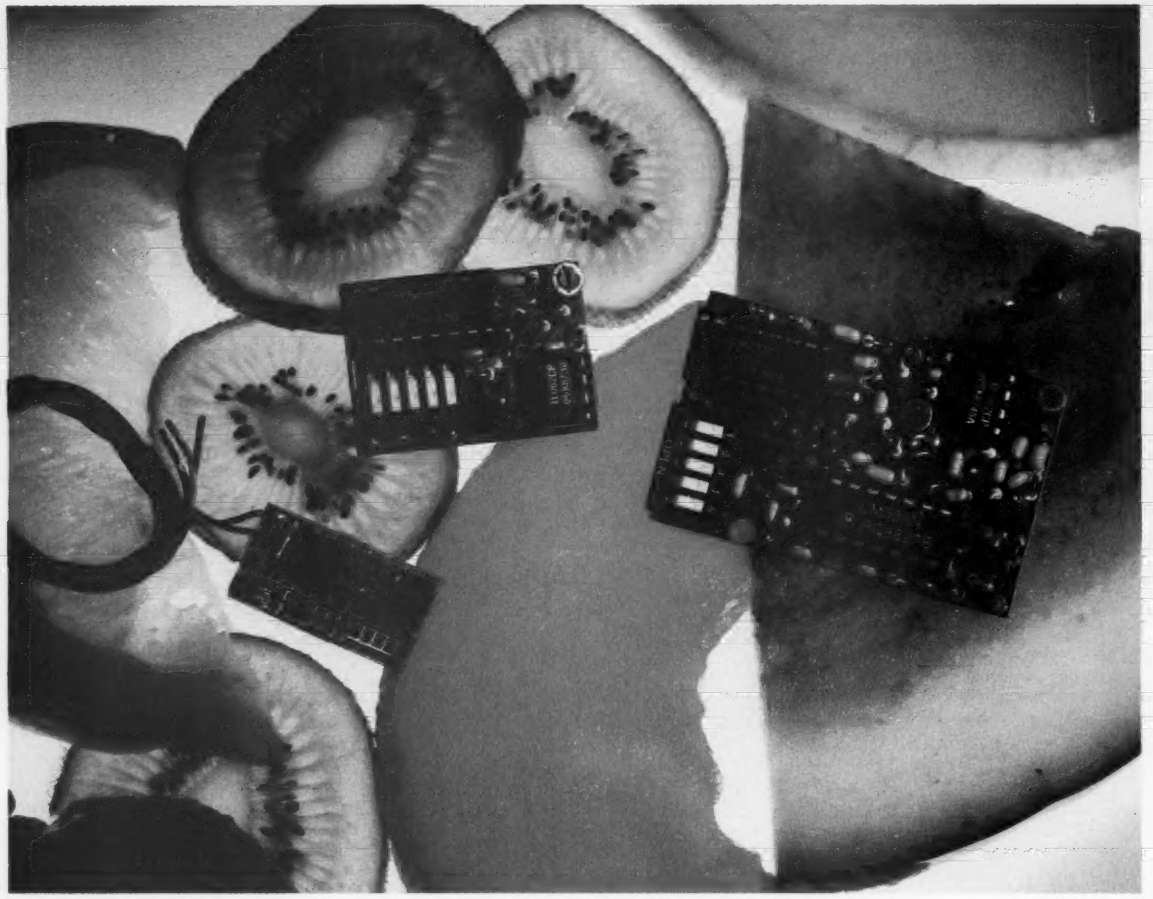

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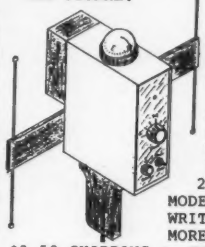

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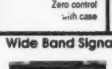

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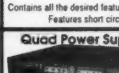

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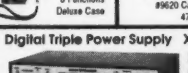

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The Desert Voices Project

An overnight success story.

by Linda Reneau KA1UKM

At a de-commissioned NIKE missile site about 35 miles southeast of Minneapolis, Minnesota, station AAR5NSF of the Desert Voices project is busy handling phone patches, packet BBS messages, and MARSGRAM communications between U.S. Service people and their families and loved ones in the Middle East. The U.S. Army has recognized the Desert Voices project as an officially sanctioned Army MARS station operating under the guidance and authorization of the CONUS (Continental U.S.) MARS Director Tom Moore in Ft. Ritchie, Maryland.

Edward Addy KEØEG, owner of NW Antenna & Communications in Minneapolis, first conceived of the Desert Voices project last October. By the first week in November, people and resources were coming together so quickly that, according to MARS Digital Communication Coordinator Paul Ramey WGØG, one of the biggest challenges was to make sure that everything was being put together in an orderly way. "All we had to do was say, 'We need it,' and someone would come forward with it."

Although thousands of hours went into the acquisition of equipment and renovation of the site—painting, rewiring, construction of operating positions, and installation of the multiuser LAN computer system—Ramey WGØG says it "came together overnight." Addy KEØEG, who designed the antenna system and communications center, gave much of himself, both financially and personally, Ramey said. When Addy presented his plans to other businesses, the donations quickly started rolling in.

The U.S. Bureau of Mines provided the lease for the 34-acre site and the buildings. Unused for 20 years, it took many hours and materials to get the main building in shape. Local businesses freely donated "all the right stuff" to repair, repaint, rewire, and upgrade the old building's heating and electrical systems. Other businesses provided electrical power, telephone service and FAX time, carpentry skills, furniture, graphic and printing services, video documentation and training materials, and office equipment.

Well-Equipped

Regional Sales Manager Mike Forsyth of Kenwood U.S.A., who first let *73 Magazine* know about the Desert Voices project, says that Kenwood has supported the project with thousands of dollars worth of radio equipment. "We couldn't have gotten on the air so quickly without their help," said R. Hugh Beebe WL7AIT, MARS Liaison for command and control. Other contributors include: AEA Electronics, four TNCs; D.F. Countryman of St. Paul, RF patch panel material, connectors, and RG-8/U coaxial cable; and A&C Metals of Blaine, Minnesota, heavy duty antenna mast material.

From outside the facility, you can see two full-size rhombic antennas for transmitting phone patches, two 4-element 20m monobanders and one 6-element monobander for 15m HF operation, a 40m dipole, and VHF antennas. Northeastern States Power Company provided the materials and crew to install the 547′ x 250′ rhombics on eight 105′ tall power poles. They also donated 8000′ of #2 solid copper wire. Without these antennas, Desert Voices would not be able to achieve reliable communications with the Middle East some 6500 miles away. Delmar Land Surveyors surveyed the exact location to make sure the antennas were correctly aligned.

St. Paul Tower constructed a 120′ tower between the two rhombics. Later, they will install six antennas for communications with other MARS stations throughout the U.S. Mirage/KLM has donated three special beam antennas for this tower, and Telex Hy-Gain is providing a rotator. Technical Materials Corp. of Mamaroneck, New York, provided low-loss, high power, precision antenna balun transformers and terminators for the rhombics.

The project actually comprises three complete radio station systems at the Desert Voices site. By the third week in January, the second station will be complete and the phone-patch capacity will rise to 1000 per day. It will be one of the four largest MARS relay stations in the world.

A Priceless Service

Desert Voices radio station AAR5NSF went on the air December 13, 1990. Within a month, it had handled over 600 phone patches and 400 packet communications. It is directly interfaced to the gateway MARS stations on the East Coast and serves as an alternate gateway, or relay, station for Army MARS. Thanks to volunteers from the Civil Air Patrol, the military (both active and reserves, including the Minnesota National Guard), law enforcement agency dispatchers, and—of course!—the amateur radio community, the Desert Voices station operates around the clock, seven days a week. There are four radio operators on duty at all times.

Ramey WGØG says that about 150 hams have assisted the project in some way, and Addy KEØEG confirms that 93 hams are currently on active duty at the station. "They're doing a tremendous job," Addy says. And Ramey: "It didn't take any arm-twisting." Most importantly, says Ramey, the ham community's speedy response to the call for help proves that hams are "a reliable resource for their country." They have freely given of their time, knowledge, and skills. Some have donated money or equipment. At Desert Voices, radio operating skills and techniques, learned in fun, are put to serious, disciplined use to provide a service that "you can't put a price on," says Addy. How much is it worth to a mother, father, spouse, or friend to get in touch with a loved one who is in an uncertain and potentially dangerous situation? R. Hugh WL7AIT adds that Desert Voices is not representing any political opinions about the situation in the Middle East. "We're providing a human service."

Ready for the Future

All the staff interviewed at Desert Voices agreed that there are few activities more satisfying than using your abilities to benefit others. The amateur radio operators at Desert Voices are gaining that unique fulfillment you get from knowing that you have ability, and are able to use it skillfully.

Addy KEØEG reminds us that one of the basic purposes of maintaining the Amateur Radio Service is "to provide a pool of trained radio operators" for the country for emergency communications. Entrusted with valuable radio spectrum for their personal use, there is nonetheless the expectation that hams will be useful when the need arises. Ramey says the response shows that hams are willing and eager to "give something back" to the country that supports the continued existence of their hobby.

In his letter to Kenwood, Hugh WL7AIT wrote that upon return of the forces from Saudi Arabia, "we envision the equipment at the Minnesota site to be returned for further humanitarian support missions that may be encountered in the future." At that time, the site itself will be returned to the Minnesota National Guard; however, MARS personnel and members will be ready to step in to provide emergency communications whenever it again becomes necessary. Hopefully, there will always be plenty of hams who, for the sheer love of radio communication, will be ready to do their part, too.

Author's Note: Let us know when you, or someone you know, is involved in activities helpful to the country, community, and world. Sure, you'd rather stick by your rig in

Continued on page 77

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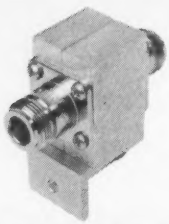

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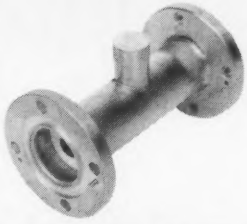

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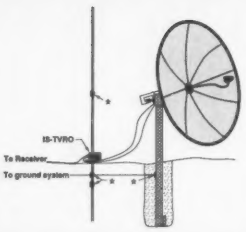

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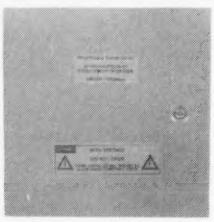

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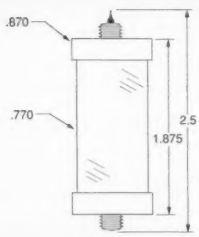

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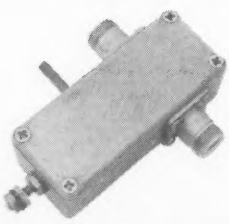

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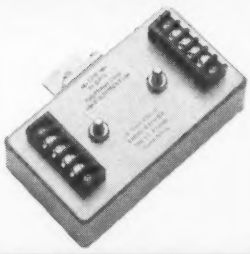

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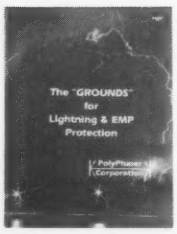

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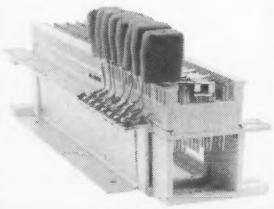

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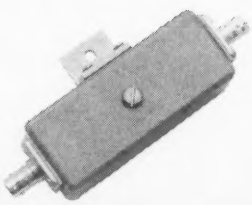

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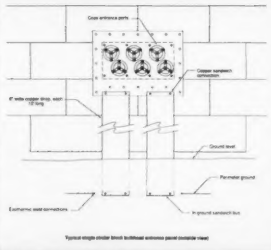

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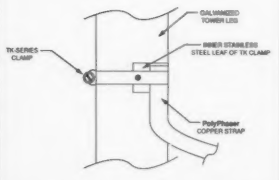

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Elementary Mode S

Satellite fun on 2.4 GHz–the easy way!

by Ed Krome KA9LNV

The launch of the Microsats has provided some really interesting opportunities for experimentation in both operating modes and frequencies. The digital modes include PSK (Phased Shift Keying) from 1200 baud (PacSAT and LuSAT) to 9600 baud (UoSAT 14), 1200 baud packet AFSK (Audio Frequency Shift Keying) (DOVE), digitized pictures (WeberSAT), and a digi-talker (DOVE).

If this isn't enough to make any experimenter think he's in heaven, there are also three different frequency schemes in use. The most common frequency combination is Mode J, with a 2 meter (145 MHz) uplink (Earth to satellite) and a 70cm (435 MHz) downlink (satellite to Earth). The active digital repeater/mailbox satellites, PacSAT, LuSAT and UoSAT, use this scheme. DOVE's main transmissions are on the 2 meter band, as this satellite was designed for easy reception in classrooms using a minimal ground station.

Two of the satellites (PacSAT and DOVE) also incorporate a third downlink frequency as a beacon: Mode S, which operates in the 13cm band. Way up there. Yeah, 2400 MHz. What, you don't have any 13cm equipment? That's not hard to believe, since that is the lowest band for which there is not a single piece of integrated commercial equipment available. No plug-in modules for the Yaesu FT-736, either. But the band is there, part of our amateur allocation, and alive and well. OSCAR-13 has a full transponder for Mode S, allowing QSOs with a 70cm uplink. And various areas of the country have terrestrial activity in a different segment (2304 MHz) of the band. There is even EME (Earth-Moon-Earth) activity up there.

While this is more of a "how to" than a pure construction article describing 13cm receiving equipment, I have included "benefit of experience" construction techniques on some commercially available kits. And, for the more adventurous types, I have included construction information for a 13cm antenna.

Mode S and How to Get There

Becoming active on the downlink end of Mode S has the same requirements as any other band: an antenna to catch the signal and a receiver to hear it. On the higher VHF and UHF bands, the receiver part of this recipe is usually handled with a two-part approach. A converter changes the VHF or UHF signals to something more manageable, which is then fed to an HF or VHF receiver. In this manner, one good HF or VHF receiver (or transceiver) can be used for many bands by merely adding the appropriate converter. In my own station, my integrated receivers and transmitters are all HF stuff, good only to 30 MHz. And they contain lots of vacuum tubes, too. Converters do everything beyond that, and sometimes converters get plugged into converters. This works fine.

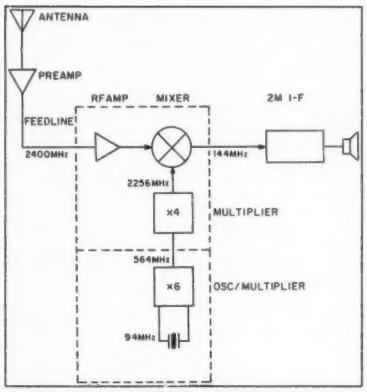

Figure 1. Basic 2400 MHz receiving converter.

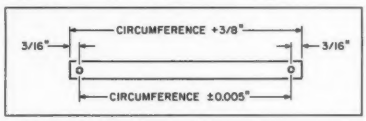

Figure 2. Loop yagi element dimensions.

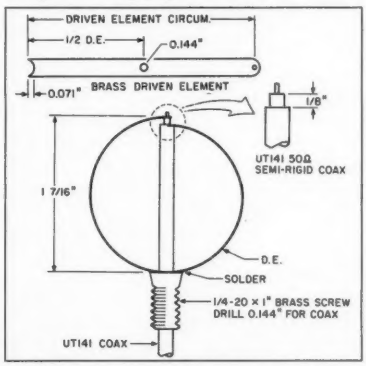

Figure 3. Driven element construction.

Coming up with a receiving converter for 13cm presents some interesting problems. A basic 13cm converter, like any other superheterodyne device, consists of three parts: an RF amplifier chain, a local oscillator, and a mixer. Because antennas and converters are usually separated by some distance and coupled by some sort of (lossy) feedline, standard practice is to divide the RF amplifier section of the converter into two separate parts: the converter proper, and a second part of the RF amplifier chain, called a preamplifier, mounted as close as possible to the antenna. (See Figure 1.) While preamps can't compensate for an inadequate antenna, they can do wonders for high loss feedlines. And they get better as the frequencies get higher. A very low noise preamplifier mounted close to the antenna will amplify the desired signal as well as the background noise. At frequencies above 432 MHz, background noise from the sun, sky, etc. is quite low, so you amplify a lot of signal and not much noise. The cable connecting the preamp to the rest of the converter merely attenuates the desired signal, but it attenuates any accompanying noise with it as well.

Within limits, the all-important signal-to-noise ratio is mostly preserved, even from a long run of pretty lousy cable. If you mounted that same very low-noise preamp after a run of cable, the preamp would be amplifying a signal attenuated by the loss of the cable. The signal-to-noise ratio would be lower, and once signal is lost, it's gone forever. It doesn't matter how much gain you add, you just amplify noise. And any cable becomes lossier as the frequency goes up. For example, a 100-foot run of Belden 9913 may have only 1.6 dB loss at 144 MHz, but it has over 10 dB loss at 2400 MHz. Extremely good coax can minimize this, but have you priced ⅞" Andrews Heliax hardline and connectors

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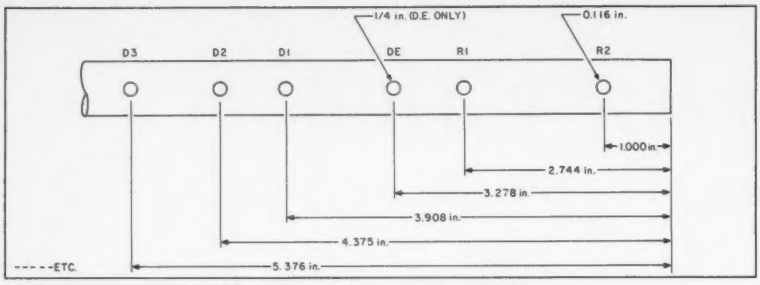

Figure 4. 13cm loop yagi boom drilling.

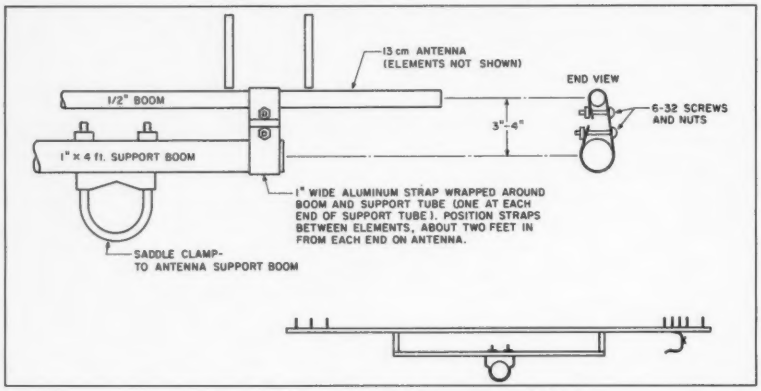

Figure 5. 13cm antenna and support assembly.

lately? Preamps are much cheaper.

Current technology in low-noise, high performance preamps uses GaAsFET (Gallium Arsenide Field Effect Transistors) devices. SSB Electronic and Down East Microwave manufacture good preamps. Later on in this article I'll detail a home-constructed device that offers good performance at a reasonable cost.

Since we have been working from the back end forward, the last part of the Mode S equation is the antenna.

Among EME types, the parabolic dish is the only way to go. The rest of us have really only two readily reproducible designs to work with, the loop yagi and the helix.

The Yagi-Uda (usually called simply "yagi") type of antenna, with many near half-wavelength parasitic elements, is the most common design at VHF and lower frequencies. Element lengths get unmanageably critical at 23cm and above, so yagis have mostly been replaced by the loop yagi. Loop yagis were originally developed by Mike Walters G3JVL and replace the yagi's straight elements with near full-wave loops made from strips of aluminum. Construction tolerances are still tight, but manageable. One of the best parts of a loop yagi is the driven element feed system. No balun is required, just a solder-it-together brass loop element on a piece of feedline. And it is at DC ground, which provides static electricity protection for your equipment. You can buy loop yagis in kits or ready-made (from Down East Microwave), or you can "roll your own."

Available Hardware

A review of available receiving equipment for Mode S shows both kits and built-up converters and preamps available from SSB Electronics and Down East Microwave. Down East Microwave also has antennas and carries the SHF Systems line of "no-tune" converter kits and built-up units.

Homestyle—Almost

Now let's look at what it takes to get a real working station going on Mode S, home-construction style. The problem with 13cm limiting equipment construction to a (very) few hard-core types can be summed up in one word: alignment. Once you build something, you have to get it working. Then you have to optimize it. To align a piece of receiving gear, you have to have something for it to listen to. But on 2400 MHz it is about as difficult to build a signal source as it is to build the converter it was intended to align. Remember "Catch 22"? Tricky, eh?

Recently, equipment has become available that is changing all that. Traditionally, converters and receiver front ends have consisted of myriads of sharply tuned circuits with trimmer capacitors and lots of interactive adjustments. Designs of this type are hard enough to get working at HF frequencies, and they get progressively worse as you go higher. The best alignment (and troubleshooting) device, the spectrum analyzer, is not a household appliance. In their quest for compact, reproducible UHF ham gear, several amateurs, among them Richard Campbell KK7B and Jim Davey WA8NLC, have developed a series of "no-tune" transverters. Honest. Only one possible adjustment in an entire transverter and that is in the local oscillator. That doesn't sound too bad, does it?

These no-tune transverters are based on two developments. One, the MMIC, is recent. The second, bandpass filtering using broadband printed hairpin filters, has been around awhile. MMIC's or Monolithic Microwave Integrated Circuits are truly incredible devices. Tiny and inexpensive, they are broadband gain blocks with fixed input and output characteristics. They don't oscillate or require any critical external components. They are typically 50 ohms in and out with low VSWR. With these devices, gain is so easy to get that it is no longer necessary to worry about whether or not you get gain from more ticklish circuits, such as frequency multipliers, or to worry about filter loss. Not enough signal at some stage? Add another MMIC. No problem.

With gain no longer a problem, the designers could do things like develop passive, no-tune diode frequency multipliers. Drive a diode into generating harmonics and select the one you want with filters. Anyone who has ever built VHF gear knows that the worst part of the whole mess is getting active frequency multipliers to work right. Ugh.

Easy, broadband gain also worked well

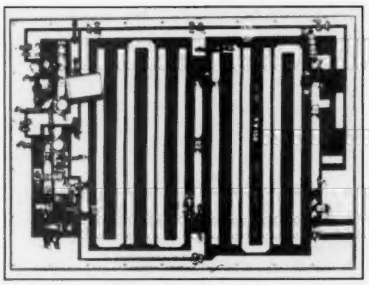

Photo A. 564 MHz local oscillator (Down East Microwave SHF-LO).

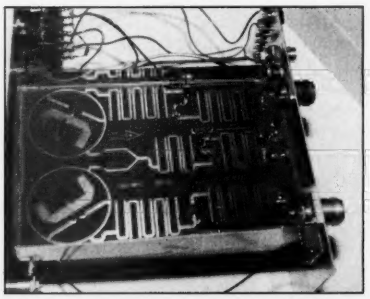

Photo B. Mode S transverter board (Down East Microwave SHF-2301).

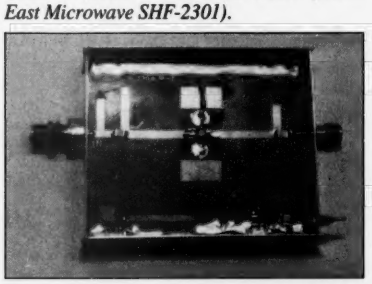

Photo C. 13cm "no-tune" preamp (WB5LUA design—available from Down East Microwave).

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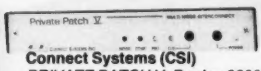

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CIRCLE 41 ON READER SERVICE CARD

with the design of printed hairpin bandpass filters. Filters were designed with manufacturing tolerances taken into consideration to provide broad, flat passbands and steep slopes. Manufacturing irregularities which were once fatal now have little effect. These filters also have no tuning required, or even possible.

The entire no-tune transverter is available in two forms as kits from Down East Microwave. One version is a dedicated S-band receive converter (the SHF-2401K). The second is a transverter, which has the same receiver and also a 10 mW transmit section (SHF-2304). If you are going to build something like this anyway, get the transverter and help get more amateur activity on 13cm. Even barefoot, 10mW is adequate for local contacts. You can always add transmit power later. Remember, as amateur radio operators, we either use those frequencies or we may lose them. The commercial guys are always hungry for spectrum, and ours looks tasty. Both units use a 2 meter IF (Intermediate Frequency). *[Ed. Note: See the February 91 issue of 73 for a review of these kits.]*

Construction Hints

As the photos show, construction of these devices is straightforward. Build the local oscillator first. You must follow the recommended layout and use good construction techniques. Keep the leads short and solder the joints well. Be sure to ground the one pad that is noted as requiring through-the-board grounding. Also, pay attention to the orientation of the transistors and MMICs. The Avantek MSA-04 series has the dot on the output, while the MCL MAR series has the dot on the input. The total tune-up requirements are to tweak a 10 pF trimmer for maximum LO output. Photo A shows a complete and functioning local oscillator.

A common complaint deals with the difficulty of installing chip capacitors. To do this right, you need a small (15 watt) soldering iron with a small tip, tweezers, a toothpick, and a magnifying glass. The last item is a suggestion that I learned through experience. Since I passed a certain magic age, I find I can't see far away with my glasses off, and I can't see close up with them on. So I bought a set of Sears headband-mounted binocular magnifiers. These are only 2½ power, but they're perfect for getting parts in the right place.

To mount the chip caps (now that you can see them), first lightly tin one circuit board pad. Don't tin both or the chip may not sit flat on the board. Then place the chip cap where you want it with the tweezers. Hold it in place with the toothpick and remove the tweezers. Touch the iron to the pre-tinned circuit board trace. Flow the solder onto the end of the cap. Then solder the other end of the cap. Resolder the first end if needed to insure a good connection.

Construction of the converter board itself is probably even easier than building the LO (Local Oscillator). The hard part, at least on the early boards, is that you must use thin brass foil to connect the MMIC ground leads and several pads to the ground plane side of the circuit board. I found that the best way to ground the MMICs is to cut pieces of brass foil about ¼" long and as wide as the MMIC ground pads, then make a 90 degree bend back about 3/32" from one end. Slip the long end through the board hole from the circuit side (use the magnifiers to make absolutely sure that there are no shorts to the input or output pads), then hold it in place by putting an awl into the hole. This will form the brass to the hole at the top, allowing you to insert the MMIC down into the hole in the board, where it belongs.

While holding the foil in the hole with the

2304/2401 MHz Loop Yagi

Element	Spacing (Original 2304 MHz) (inches)	(cm)	Circumference (Original 2304 MHz) (inches)	Circumference (Scaled to 2350 MHz) (inches)
R2	1.000	2.54	5.480	5.373
R1	2.744	6.97	5.480	5.373
DE	3.278	8.33	5.125	5.025
D1	3.908	9.93	4.676	4.584
D2	4.375	11.11	4.676	4.584
D3	5.376	13.66	4.676	4.584
D4	6.378	16.20	4.676	4.584
D5	7.081	17.99	4.676	4.584
D6	8.380	21.29	4.676	4.584
D7	10.383	26.37	4.676	4.584
D8	12.385	31.46	4.676	4.584
D9	14.388	36.55	4.676	4.584
D10	16.390	41.63	4.676	4.584
D11	18.393	46.72	4.676	4.584
D12	20.395	51.80	4.534	4.445
D13	22.398	56.89	4.534	4.445
D14	24.400	61.98	4.534	4.445
D15	26.403	67.06	4.534	4.445
D16	28.405	72.15	4.534	4.445
D17	30.408	77.24	4.534	4.445
D18	32.410	82.32	4.392	4.306
D19	34.413	87.41	4.392	4.306
D20	36.415	92.49	4.392	4.306
D21	38.418	97.58	4.392	4.306
D22	40.420	102.67	4.392	4.306
D23	42.423	107.75	4.392	4.306
D24	44.425	112.84	4.335	4.250
D25	46.428	117.93	4.335	4.250
D26	48.430	123.01	4.335	4.250
D27	50.433	128.10	4.335	4.250
D28	52.435	133.18	4.335	4.250
D29	54.438	138.27	4.335	4.250
D30	56.440	143.36	4.335	4.250
D31	58.443	148.45	4.335	4.250
D32	60.445	153.53	4.335	4.250
D33	62.448	158.62	4.335	4.250
D34	64.450	163.70	4.335	4.250
D35	66.453	168.79	4.335	4.250
D36	68.455	173.88	4.279	4.195
D37	70.458	178.96	4.279	4.195
D38	72.460	184.05	4.279	4.195
D39	74.463	189.14	4.279	4.195
D40	76.465	194.22	4.279	4.195
D41	78.468	199.31	4.279	4.195
D42	80.470	204.39	4.279	4.195
D43	82.473	209.48	4.229	4.146
D44	84.475	214.57	4.229	4.146
D45	86.478	219.65	4.229	4.146
D46	88.480	224.74	4.229	4.146
D47	90.483	229.83	4.229	4.146
D48	92.485	234.91	4.229	4.146
D49	94.488	240.00	4.229	4.146

Boom: 8' length of ½" diameter aluminum tubing (do not use anodized tubing).
Elements: All elements are made from aluminum strips 0.25" wide by 0.032" thick.
Circumference: Distance between centers of 0.116 holes drilled in each element. Tolerance ±0.005". Each element is to be made approximately ⅜" longer than the specified circumference dimension to allow approximately 3/16" overlap between the ends of the element.

Table 1. Scaled from W1JR 13cm 52-element design.

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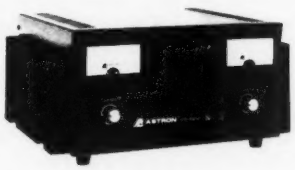

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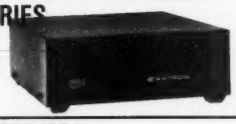
SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

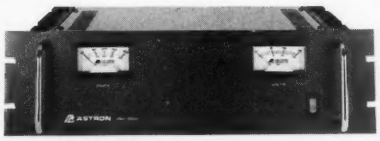
SL SERIES



MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• LOW PROFILE POWER SUPPLY						
SL-11A	•	•	7	11	2¾ x 7⅞ x 9¾	11

RS-L SERIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7



RM SERIES MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS - Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 10 ON READER SERVICE CARD

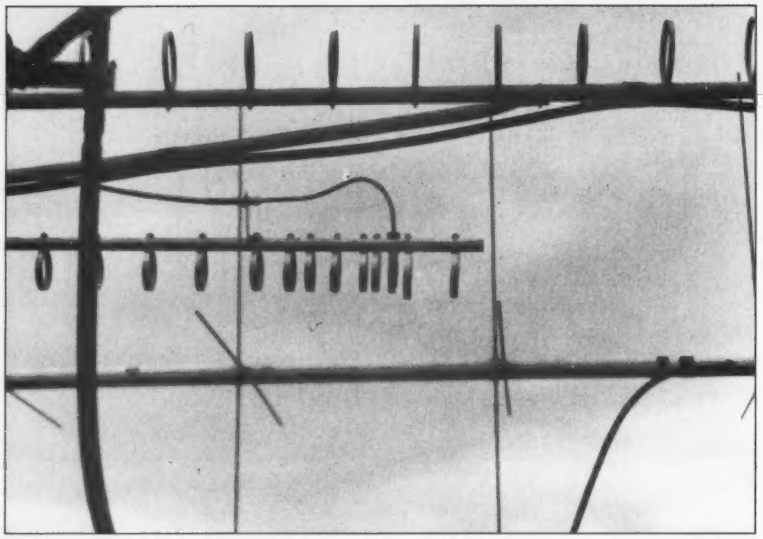


Photo D. 13cm loop yagi, mounted upside down, showing driven element detail and two reflectors. A 23cm loop yagi is on top, with a 2m cross yagi behind it. The T-shaped structure on the left is the power divider with hardline phasing lines for two 19 element yagis on 70cm.

awl, use your fingernail to spread the foil away from the hole and lock it into place on both sides of the board. A little experimenting will make it easy. Before you solder, inspect it carefully for shorts. Solder the top side lightly so the MMIC will sit flat on the board. Sometimes it is helpful to solder the pad, then clean it off with a piece of Solder-Wick™ desoldering braid. The resulting pad will now be well-tinned and easy to solder quickly.

Several pads on the converter board must be connected to the foil side of the board. One way to do this is to make slots in the board by carefully rocking an X-acto® knife blade through the board. The Teflon™ board material cuts easily. Then thread a strip of the brass foil through the slot, bend it flat on both surfaces, and solder it in place.

A suggested construction technique is to solder the MMIC bias resistors to the centers of the hairpin filter elements where possible. This improves stability. Photo B shows the routing on a complete transverter board.

Mounting the HP-2822 diode packs can be interesting. They are as small as chip capacitors, have three leads, and are surface mount devices. The same technique that works on the chip caps works here also. Tin one pad, position the diode pack with tweezers and a toothpick, then tack one lead. Then solder everything.

The initial results using this converter absolutely amazed me—it worked the first time I fired it up. I heard the S-band beacon on DOVE the first time I tried. Not bad.

A suggestion on improving the versatility of the converter: Wire it to work both commonly-used segments of the band. Remember about "use it or lose it"? The satellite subband is at 2400 MHz. Use of a 94.00 MHz crystal in the LO puts the Microsat S-band beacons (2401.221 for DOVE) at an IF of 145.221. A 90.00 MHz crystal will put the 2304 weak signal frequency at 144 MHz. Wire a small DPDT relay to the board to switch between the two crystals. Keep the leads short.

Preamp Construction

The next segment of the Mode S rig is the preamp. Fortunately, Al Ward WB5LUA has developed a series of no-tune preamps for the UHF bands, all the way to 10 GHz. These were detailed in *QST*, May 1989. Construction is easy, but for best results you must follow Ward's instructions. The 13cm version uses an ATF 10135 GaAsFET, and offers a less than 1 dB noise figure. While all the preamps were shown with grounded sources (which require separate gate bias supplies), the 13cm unit was also shown in a self-biased version. This means that there is no negative gate bias supply to fuss with, but you must ensure that the source leads are properly RF grounded.

Proper RF grounding of the two source leads is done by connecting them to very low inductance disk capacitors. The RF energy thinks the capacitors don't exist and that the source leads are really grounded, but there is no DC ground. So, self-biasing is accomplished by standing the sources above DC ground with a resistor.

Never content to leave well enough alone, I built two preamps and used slightly different construction techniques on each. On one unit, I drilled holes to fit the disk capacitors through the circuit board as instructed in the article, then grounded the capacitors underneath.

On the second I used a different technique. First, use the X-acto knife to make slots in the circuit board at the inside edges of the small rectangular pads on either side of the GaAsFET. Then thread ¼″ wide strips of very thin brass foil through the slots. Flatten the foil to the board and solder it to both sides. Tin one side of a disk capacitor. Then position one disk capacitor properly (with the tinned side down), and heat the brass strip from the underside with a 40 watt iron. When the heat transfers through the foil, it will melt the solder and stick the capacitor in place. It is very easy to break a disk cap by excess pressure, so be careful. After mounting the disk caps, check them with an ohmmeter to insure against shorts to ground.

The circuit board is very flexible and bends easily, so make it more rigid before mounting the rather delicate chip devices. One way to do this is to bend or piece a ¾″ wide by 0.016″ thick hobby brass strip all the way around the circuit board. Leave ⅛″ overlapping the bottom side of the board. Mount the connectors and feed-through on the strip. Then solder connectors and strip to the circuit board. Solder the board ground plane to the strip all around. Mount the chip components, zener diode and GaAsFET last. Doing the heavy soldering between the walls and board first not only physically protects the components from fractures induced by bent boards, it also keeps you from frying the chip components.

Kits are available from Down East Microwave. I built two of these, one with right-angle-mount N-connectors and one with end-launch SMA connectors, just like Ward suggested. Both work, but the SMA version (which has the brass foil source grounding straps) works better. This unit is shown in Photo C.

The Antenna

Last but not least is the loop yagi. The design I used was based on that presented by Joe Reisert W1JR at the first annual 1296/2304 Conference (19–22 September, 1985, in Estes Park, Colorado). His design was for 2304 MHz. Since I wanted to use the antenna on both 2304 and 2401, I did the unpardonable and scaled W1JR's element lengths to 2350 MHz. I did not change the element spacing. This antenna has 52 elements and fits on an 8′ section of ½″ diameter aluminum tubing.

One method of building this antenna is to get a sheet metal shop to shear a bunch of ¼″ wide strips about 2′ long from a sheet of 0.032″ thick aluminum. Do not use anodized aluminum for the elements or the boom. Element lengths and spacing are itemized in Table 1. Scribe off the required lengths on the strips with a steel scribe point set of dividers. Adjust the dividers with a dial caliper and lay them off. Recneck each dimension. Tolerances are ±0.005″, so be careful. Remember to leave 3/16″ between the center of each hole mark and the end of each strip and ⅜″ between adjacent holes on a strip. These will be cut apart later, as it is easier to handle a whole strip. After you scribe a length, mark the element number or group on it with a waterproof marker. Then, with a magnifying glass, center punch each mark accurately. Drill each hole 0.116 (#32 drill) in diameter. Drill them one hole at a time; stacking strips is a sure way to goof. Finally, cut the element strips apart.

Preform each element loop by bending it around a form. A piece of ¾″ PVC pipe works fine.

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RELM's new LMV2548B gives you up to 48 channels which can be organized into 4 separate scan areas for convenient grouping of channels and improved communications efficiency. With an external programmer, your radio technician can reprogram this radio in minutes with the **PM100A** programmer for $99.95 without even opening the transciever. A similar 16 channel, 60 watt unit called the **RMV60B** is available for $489.95. A low band version called the **RML60A** for 30-43.000 MHz. or the **RML60B** for 37-50.000 MHz. is also available for $489.95.

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List price $549.95/**CE price $239.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
Now...nothing excluded in the 806-912 MHz band.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-A** is available for $178.95.

NEW! Uniden® MR8100-A

List price $849.95/**CE price $486.95**
12-Band, 100 Channel • Surveillance scanner
Bands: 29-54, 116-174, 406-512, 806-956 MHz.
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List price $549.95/**CE price $249.95/SPECIAL**
10 Meter Mobile Transceiver • Digital VFO Full Band Coverage • All-Mode Operation Backlit liquid crystal display • Repeater Splits RIT • 10 Programmable Memory Positions
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RELM LMV2548B Only $289.95

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BC177XLT-A *Bearcat* 16 ch. 11 band scanner ... $134.95
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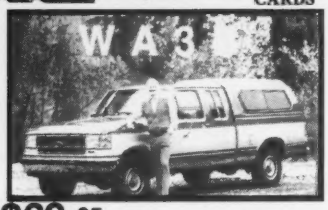

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To mark the element locations on the boom, it seems that millimeters are easier to use than inches, so I converted W1JR's dimensions. It's hard to find a tape measure that reads out in decimal inches! Lay a tape along the boom and mark each location. Dimensions are from the end of the boom. This prevents cumulative errors.

Drilling the boom squarely can be challenging. Eyeballing doesn't work. Use a "universal drill guide" with a V-notch designed to drill holes in the center of a pipe.

Before you start drilling, you must devise a method of preventing boom rotation while drilling, thereby keeping all the drilled holes in line. You must also support the boom high enough off the bench so that the drill guide can slide. One way to do this is to first drill a hole through the boom large enough to clear a 1½" long No. 4 or 6 wood screw. Run the screw into the bench only about ¼". The boom will now be free to move up and down as the drill guide is moved, but will be rotationally fixed. Two screws in different locations may be required if your drill guide has a large base and you can't get all the holes without hitting the screw. Slide the drill guide along the bench with the boom in the V-notch and drill each 0.116" hole. Remember to drill the driven element hole ¼" in diameter.

When assembling the elements to the boom, use 4-40 x ¾" stainless screws, nuts and lockwashers. Put the lockwasher between the nut and the boom, not under the element. Coat the ends of each element with a corrosion inhibitor such as No-Al-Ox™. Weather turns aluminum into aluminum oxide, which is a dandy insulator. No-Al-Ox is available from your local electrical supply house and well worth the nominal cost. Assemble the elements with the overlaps all facing the same direction.

For the driven element, drill a 0.144" (#27 drill) hole through a ¼" brass flat head bolt. Also drill the center of the brass strip driven element to 0.144." You must assemble all the parts (element, bolt, nut, boom, etc.) on the UT141 hardline before you solder things together. Use hobby (low-temperature) silver solder and flux for all outdoor connections as it does not deteriorate from weather like regular rosin core solder. A note: Go easy on the heat on the hardline. If you overheat it, it can swell and rupture. Then you start over. I did.

The finished product, or at least the driven element end, is shown in Photo D amidst a variety of other antenna goodies. Once again, complete antennas and antenna kits are available from Down East Microwave.

The 8' long, ½" diameter boom is flimsy and requires mounting support. The strap mounting method shown is easy and works. A single U-bolt through the support boom mounts the whole thing to the antenna cross boom. See Figure 5.

A note on antenna mounting: Many satellite operators use a nonmetallic cross boom between their antennas. This tends to cut down intermod problems on the harmonically related modes, such as Mode J. If you mount this (or any) antenna on an insulated boom and leave the preamp connected, remember where atmospheric static electricity has to go —down the lead in coax into the shack. Keep the coax disconnected from the equipment and thoroughly grounded in the shack when the antenna is not in use. Never use the antenna when thunderstorms are in the area. We are not talking about a direct lightning strike here either; there is little real protection from a situation like that. I strap-ground the 1296 and 2401 antennas right up on the mounting boom.

Results

Now the big question: Does it work? Since I do not have access to test equipment for this frequency, I took the pragmatic approach—I tried it. The first test was with the loop yagi connected to the no-tune downconverter through three feet of RG-142, 12 feet of RG-213 around the rotors, and 65 feet of 9913. And no preamp, as it wasn't built yet. But I heard the DOVE S-band beacon on the first try.

Since the addition of the WB5LUA no-tune preamp, the DOVE beacon is loud enough to hold the PLL (Phased Lock Loop) on my G3RUH PSK modem, and autotune the attached receiver. DOVE's 100 kHz Doppler shift makes this rather touchy sometimes, as a brief fade can cause the signal to run out of the capture range of the modem. Mostly it holds surprisingly well, considering that the rate of change of frequency fairly screams across the band.

This arrangement also works on the big guy, AO-13, Mode S. Downlink signal strength is marginal for SSB, but quite adequate for CW. However, perseverance has yielded a handful of sideband contacts on that mode, which is quite a thrill. Two hints are useful at this point. First, lots of multiplication (X24) between the LO crystal and the injection frequency offers the potential for large frequency conversion errors. It can be very difficult to predict where to initially find S-band signals. My own set-up has over 50 kHz frequency offset, exclusive of Doppler. The solution is to start by trying to find a loud, strong signal like DOVE and tune all over the place until you find it. Then track the signal, recording the apparent frequency and time and compare TCA (Time of Closest Approach, where the Doppler correction should be zero) to the published actual beacon frequency.

Second, the antenna described here is marginal at best for AO-13. The AO-13 13cm beacon is only a watt or so, and at times is 42,000 kilometers away! When you hear a Mode S signal, rock the antenna position to peak it. It is surprising how much difference this can make.

The advent of no-tune preamps and converters has brought Mode S into the realm of the average experimenter. Good construction practices and attention to detail are rewarded by excellent performance on frequencies previously considered almost unattainable. Now, go out and build some gear. See you on Mode S! 73

Contact Ed Krome KA9LNV at 1023 Goldfinch Rd., Columbus IN 47203.

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CT-90	10 Hz–600 MHz	<10 mV to 150 MHz <150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	<25mV to 50 MHz <15 mV to 500 MHz <100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	<25 mV to 50 MHz <10 mV to 1 GHz <50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$239.95
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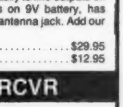

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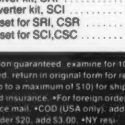

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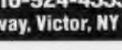

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CIRCLE 34 ON READER SERVICE CARD

Touch-Tone Activated Scanner

So you won't miss a call!

by Don Moser AA7Y

Inexpensive, wide-frequency coverage scanners have been developed into valuable tools for the amateur radio operator. There are, however, two drawbacks that keep them from reaching their full potential. First, when you're scanning a number of busy repeaters and simplex frequencies, and Bert and Ernie tie up one repeater, your scanner will most likely be stuck there. If someone tries to call you on another frequency, you won't hear the call. Secondly, you (and the rest of your household) will have to listen to Bert and Ernie so you won't miss a call eventually directed to you.

Photo A. The author modified the Motron Auto Kall AK-4 to solve two common problems.

A Logical Solution

A Touch-Tone decoder alone, connected to a scanner, will solve the second problem; you won't have to listen to all the traffic until you're called. But it won't solve the first problem of the scanner getting hung up on a busy channel. Combining the logic of the decoder and the scanner will, however, solve both problems.

What happens when a normal scanner switches to a busy frequency? The squelch circuit detects a carrier and outputs a logic control signal that tells the scanner to stop scanning. To operate as a Touch-Tone activated scanner, I've opened the logic control line coming from the squelch circuit and inserted a logic signal from the first decoded digit of an Auto-Kall AK-4 Touch-Tone decoder. The scanner won't stop unless it receives the first digit of your code.

If the scanner is programmed to scan 10 frequencies, and it's scanning at the rate of 10 channels per second, the calling station must hold down the first digit of the code for at least one second. This gives the scanner enough time to make one complete cycle through all the frequencies. Once the first digit is decoded, a timer is set that stops the scanner for about 10 seconds, allowing time for the decoder to receive the rest of the code. If the right code sequence is not received within 10 seconds, the scanner resumes scanning. If the correct code is received, another timer is triggered that both turns on your speaker and keeps the scanner tuned to the calling frequency. The calling station identifies and tells you which frequency he's calling on.

I've been using this system for several years now, and it's been a real life-saver. We have four speakers connected to the scanner/decoder and placed at strategic places throughout the house and shop. My wife can always get through on simplex when she's doing errands around town. Friends from various parts of the state can use different repeaters to reach me. Early one Sunday morning, when the phone had been accidentally left off the hook, my brother-in-law was able to wake us up by calling on 2 meters; there had been a serious family medical emergency.

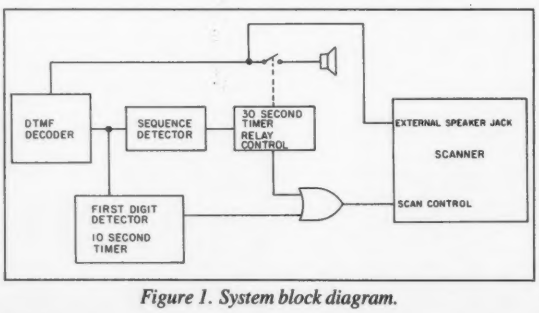

Figure 1. System block diagram.

Scanner Modifications

I implemented this scanning system using the Radio Shack PRO-57 scanner and the MoTron Auto Kall AK-4C DTMF decoder. You can use almost any scanner and DTMF decoder for this project. The PRO-57 is currently Radio Shack's least expensive scanner. Most scanners use similar receiver and scanning circuits. The PRO-57 uses the MC-3361 FM receiver IC. Pin 13 is the scan control output. When it's low, the scan function is enabled. When a signal is present, it goes high and scanning stops.

If you use a different scanner, check the schematic for the line that goes from the receive IC to the scanning section. If you check this line with a logic probe, you should see it changing states when you turn the squelch control on and off. Normally, when the receiver is unsquelched, it tells the scanning control to stop scanning. Since the scanner needs to be stopped with a DTMF signal instead of a carrier, this control line is broken and the input to the scan control is diverted to the output of the DTMF decoder. The line is broken after it goes to the mute circuit on the power amplifier.

Adding Scan-Control and External Speaker Jacks

Two mini-phono jacks (3.5mm) were added to the scanner. One is used to connect the first digit detect circuit in the DTMF decoder to the scan control in the scanner. The

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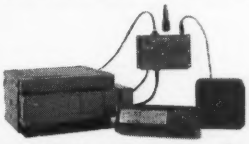

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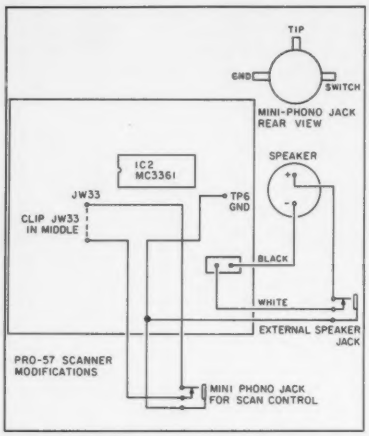

Figure 2. PRO-57 scanner modifications.

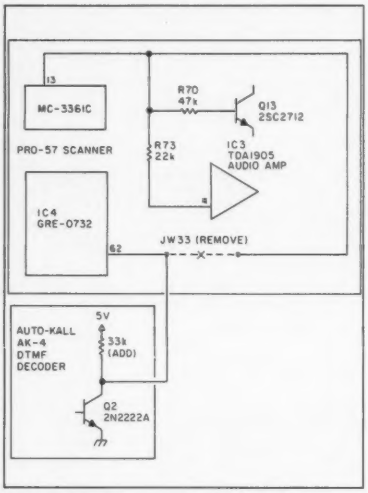

Figure 3. Scan control modifications combine the logic of both the decoder and the scanner.

other is used to add an external speaker jack to the scanner. This provides a way to feed audio to the decoder and to control the speaker line with the decoder. To add the mini-phono jacks, drill two ¼" holes on the side of the chassis, just below the speaker.

Wiring the Scan Control Jack

You don't have to remove the PRO-57's circuit boards. You do have to use anti-static precautions. Be sure to discharge any static electricity on your body by touching a ground before working on the circuit board.

There is a short jumper wire about ½" long in the center of the main board, labeled JW33. One side of JW33 goes to the squelch control, pin 13 of IC2, R73 and R70 (surface mounted on bottom of board). The other side of JW33 goes to IC4 pin 62. Clip this jumper in the middle and raise each side off the board.

Solder wires about 5" long to each side of the cut jumper. Solder the wire that goes to IC4 (the side closest of C110) to the "tip" connection on the scan control mini-phono jack. Solder the other wire (nearest D14) to the switch section of the jack. Connecting the scan control through the switch section will cause the scanner to operate normally when the decoder is unplugged. Connect a wire from the ground lugs of both the scan control and speakers jacks to TP6, the PCB ground.

Wiring the External Speaker Jack

Unsolder the white wire going to the speaker's positive side. Wire this to the "tip" lug on the external speaker jack. Wire the switch lug to the positive lug of the speaker with a short piece of wire.

Decoder Modification

The Auto-Kall AK-4 is well-suited for this project because it has two independent timers. You need one timer to stop the scanner for a short time, 5–10 seconds, upon receipt of the first digit. You need a second timer to turn on the speaker relay for about 30 seconds. You can adjust both times with on-board trim pots. The output of each timer is fed into a NOR gate which is again inverted by an open collector transistor (with a pull-up resistor added). This output is then connected to the scan control. When either timer is triggered, the NOR gate will output a logic-low that turns off the transistor. This puts a logic-high on the scan control line and causes the scanner to stop.

The first timer is used to stop the scanner for 5–10 seconds if the first digit of the sequential DTMF code is received. This stops the scanner to allow enough time for the rest of the code to be entered. If the rest of the digits aren't received, it goes back into scan mode on timeout. If the rest of the code is received, the second timer is triggered, activating the on-board relay and turning on the speaker. This timer is adjustable from about 10 to 60 seconds. A red "call" LED is also latched on, to indicate a received call.

The short timer was originally part of a "group-call" circuit. When triggered, an output would set a NOR gate latch. The timer in this circuit is modified to give an output for 5 to 10 seconds by changing C7 to 10 µF. One of the NOR gates in the latch is isolated and used to control the open collector transistor "GC" output for the scan control.

Modification Details

Remove the following parts on the decoder (AK-4) board: R4, 1k; R18, 33k; R32, 1k; C6, 1 µF; C8, 0.1 µF; and C7, 3.3 µF. Replace C8 with a jumper wire. Change C7 to 10 µF. Remove U2 from its socket, bend out pin 4 and place it back in the socket so that it's disconnected. Remove CR12.

Solder a wire from U4, pin 4, to U2, pin 1. A trace coming from pin 4 of U4 goes to a feed-through hole. Use this hole for one end of the wire by scrapping off the solder mask. Solder the other end of the wire to the hole vacated by R18 that went to pin 1 of U2. A second wire goes from the hole of C6 (that went to U6, pin 11) to the hole formerly used by R4 (that connected to U2, pin 2). Solder a 33k ¼-watt resistor (you can use R18, which was removed) from the GC output (next to +IN) to the pad marked +5.

Three jumpers on the board are used to configure the board for various functions. Connect only jumper J3; leave the other two blank.

Program the board as per manufacturer's instructions. Solder a diode from the first digit of your code, in the programming matrix, to the GC PAD. Cathode side goes to GC PAD. This will cause the short timer to be triggered when the first digit is received.

Connect the GC output of the AK-4 decoder board to the mini-phono jack scan-control input. Connect an audio cord from the external speaker jack of the scanner to the audio input of the decoder.

Testing

Start scanning several frequencies. Using a simplex frequency, hold down the first digit

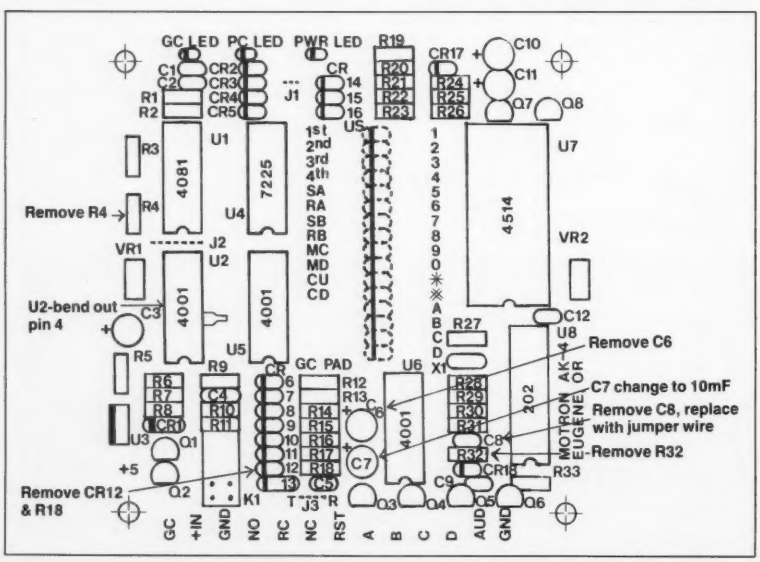

Figure 4. AK-4 modifications (circuit board details).

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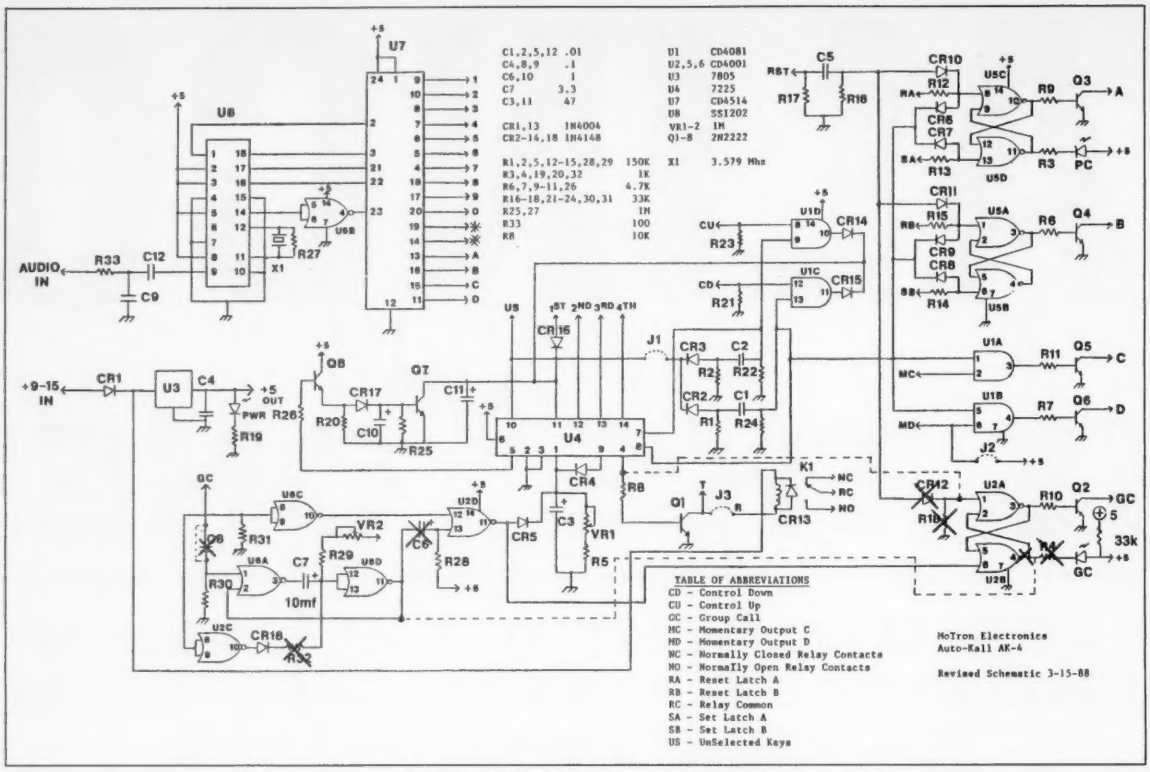

Figure 5. Modified AK-4 schematic diagram.

of your code. When the scanner gets to that frequency, the GC output should go high and cause the scanner to stop scanning. Enter the rest of your code. If all is working well, the relay in the decoder should turn on to open up your speaker or activate an alarm.

The SSI-202 decoder chip used on the AK-4 decodes DTMF signals in about 40 ms. Occasionally, if you start to enter the first digit of your code just as the scanner is crossing the calling frequency, the control signal stops the scanner too late, on the following channel. During testing, this happened only about once every fifty times.

This system will give you a powerful communications tool for either routine or emergency traffic. It will make it possible for you to be reached at any time over a wide geographic area, through the best possible path.

Although you may use other scanners and decoders, you can obtain the AK-4 or AK-4C (complete in a box with a speaker) from MoTron Electronics, 310 Garfield St., Suite 4, Eugene OR 97402. Tel. (503) 687-2118; order line, (800) 338-9058. For $10, MoTron will do the scan modifications on the AK-4W or AK-4C.

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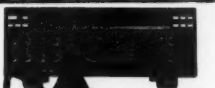

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IC-228A/H FM Mobile [illegible]w	[illegible]/539	Call $
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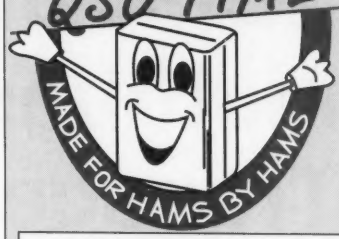

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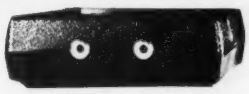

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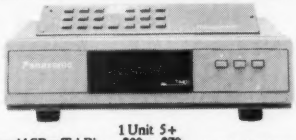

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73 Review

by Joe Holman KA7LDN

The ICOM IC-970H VHF/UHF Multiband All-Mode Transceiver

A great rig for both satellite and local communications.

ICOM America
2380 116th Avenue NE
Bellevue WA 98004
(206) 454–8155
Price Class: $3000

Recently I had the opportunity to use an ICOM IC-970H VHF/UHF (i.e., 2m and 70cm) multiband transceiver. This is a full-featured multi-mode rig designed with the satellite operator in mind. It's also a fine rig for terrestrial contacts both on SSB/CW and FM.

Photo. The ICOM-970 multiband VHF/UHF transceiver.

Dimensions and Front Panel Layout

The IC-970H is a big radio: 16.7″ W x 5.9″ H x 16.0″ D, approximately the same size as ICOM's IC-765 HF radio.

The front panel of the radio supports "bigger-the-better" controls. The tuning knob is 2″ in diameter, and the basic control knobs are 0.75″ in diameter. In the center of the front panel, there is a 4.5″ x 2.5″ black-on-yellow LCD display which provides the following information:

- Main and sub mode of operation.
- Main and sub operating frequencies.
- General coverage RX on/off.
- RIT change of frequency (only for main).
- Main and sub VFO (A or B) selection.
- Main and sub memory channels.
- Sub receiver S-meter.
- Tuning pitch indicators.
- Main and sub duplex indicator.
- Scan indicator.
- Tone/squelch/beep indicator.
- Split operation indicator.

Also, the radio has a large S meter, 2.75″ x 1.75″, that is placed directly to the left of the LCD display.

On the very left side of the radio, you can find the SATELLITE switch which provides the following six tracking configurations (and which proved to be very useful during my satellite experimentation and operation with the radio):

- OFF—Main and sub frequencies do not track.
- N (Normal)—Main and sub frequencies change in same direction.
- R (Reverse)—Main and sub frequencies change in opposite direction.
- SATL—Used for programming uplink and downlink pairs to memory, no tracking takes place.
- SATL-N—Allows selection of uplink/downlink memory channel, tracks in same direction.
- SATL-R—Allows selection of uplink/downlink memory channel, tracks in opposite direction.

I'll discuss more about the SATELLITE switch in the "Satellite Memories" section.

Manual

The manual is 48 pages long. The majority of the manual describes what each of the control functions and connections on the front and rear panels do. The remaining sections of the manual provide general operating procedures for packet and satellite operation, and provide details (with many internal views of the radio and replaceable components) about how to install optional accessories and modify factory set internal controls. I was impressed with the level of detail presented in this manual. It is one of the best that I have seen ICOM produce. See Table 1 for a complete listing of the IC-970H's specifications.

Receiving and Transmitting

During my voice communications, I spent most of my time operating on AO-13. I made QSOs on this satellite for just about three-fourths of the entire pass on two different days. This allowed me to test the IC-970H during various operating conditions, such as when the squint angle of the satellite's antenna was greater than 20 degrees, less than 20 degrees, and on the two major modes used: Mode B (70cm up and 2m down) and Mode J (2m up and 70cm down).

For antennas, I used the KLM 18C (12.0 dBi gain) for 70cm, and an old beat-up Cushcraft 10-element beam (10.5 dBi gain) on 2m. The preamplifiers were the ICOM AG-35 (15 dB gain, NA noise) for 70cm, and the ICOM AG-25 (15 dB gain, NA noise) for 2m, mounted at the antenna feedpoint. For feedline, I used an 80-foot run of Belden 9913 (2.6 dB loss per 100 feet) for 70cm, and a 50-foot run of RG-8/U foam (2.0 dB loss per 100 feet) for 2 meters.

Most of my AO-13 QSOs were made on Modes B and J. While operating on AO-13, I worked the following stations (all contacts were on Mode B, unless otherwise noted): AA6PJ, KC7IT, DD5LQ, ON1LST, PE1HXD, FC1GNV, PAØSTE, OE5WHN, SM2SWU, JA9WMS, UAØOB (both B and J), JR2UOE, and VK4KZR (Mode J only). As you can see, I made contacts with many locations around the world.

In addition, I used my IC-275H and IC-475H during these passes to compare the versatility of the IC-970H's uplink and downlink systems.

The first thing that caught my attention was the IC-970H's audio. Its audio is much more robust (better bass) than what my IC-275H or IC-475H produces. Good audio always makes satellite communications more enjoyable.

For receiving, the IC-970H has comparable sensitivity to both the IC-275H and the

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License Exams: March 26
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Spaces will be allocated by the Hamvention committee from all orders received prior to February 1. Notification of space assignment will be mailed by March 15, 1991. Checks will not be deposited until the selection process is complete.

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IC-475H. Most stations running about 25 watts and up on AO-13's 70cm uplink (for Mode B) were S-5 and above on the IC-970H's 2m downlink receiver. Similarly, stations using 2m on the uplink (for Mode J) and running about 25 watts or more, resulted in downlink signals in the range of S-4 to S-5. Stations using near 75 watts and up were producing S-9+ signals. Please note that your signals may vary due to the gain of your antennas and loss in your transmission line, and the current squint angle of the satellite's antennas. In general, though, the results were very much on a par with other satellite receiver systems that I have used in the past.

For transmitting, the 30 and 35 watts produced by the IC-970's 70cm and 2m transmitters resulted in below average signal levels when compared to many of the other downlink signals on the satellite. To increase my signal, I decided to activate the speech compressor. The speech compressor produced a very noticeable increase in signal strength and improved the basic sound quality. I estimate the gain increase was almost 6 dB (one ICOM S-unit).

1200 MHz Option

The IC-970H comes with 2m and 70cm band units installed from the factory. These two bands are primarily used for Mode B and J satellite communications. In case you want to operate on Mode L (1296 MHz uplink and 70cm downlink), the IC-970H lets you install the UX-97 1200 MHz optional band unit for Mode L use. The UX-97 supports SSB, plus CW and FM, and has 10 watts output power.

Satellite Tracking and Memories

In addition to allowing you to store 99 different frequencies into the per band memory channels, the IC-970H allows you to store 10 uplink/downlink frequencies and mode pairs (transponder uplink and downlink tracking frequencies). I found this feature to be very convenient. I programmed frequencies for AO-13's Mode B into channel 1, AO-13's Mode J into channel 2, and FO-20's Mode J frequencies into channel 3. (To program into a particular channel, the SATELLITE switch must be in the SATL position.) Now when I need to use a particular mode on one of these satellites, I put the SATELLITE switch to the SATL position, enabling the 10 special memory channels; then I select a particular channel with the Memory Channel Switch, and turn the Satellite Switch to the corresponding tracking direction (either N or R position). Tuning with the main dial now changes the main and sub frequencies in either the same direction or inverse direction, accordingly.

How did I compensate for the Doppler shift? When operating in this manner and encountering Doppler shift, just deactivate the MAIN/SUB switch, allowing frequency changes on both the main and sub VFOs at the same time. Change the RX frequency just enough to allow for the Doppler shift. After this tuning, activating the MAIN/SUB switch allows you to continue to change frequencies on both the main and sub VFOs at the same time by using the main dial.

Tracking in this manner, but not using a particular stored memory channel, is also available with the two remaining positions of the SATELLITE switch.

Scanning

The main and sub scanning features are not necessarily needed for satellite operations, but they are good for local activity. The feature I liked best is that both the main and sub bands can be selected for scanning at the same time (by using the Main and Sub Scan Switches) in addition to the more common individual band scan feature found on most receivers.

Both the main and subbands can have 99 memory channels programmed, and they each have the capability to have a selected portion of their bandwidth scanned (this feature uses the P1 and P2 memory channels). The IC-970H can perform four types of scanning: *programmed scan*, which scans between two programmed scan edges; *memory scan*, which repeatedly scans all memory channels in the selected band; *mode-select memory scan*, which repeatedly scans memory channels with the same selected operating mode in a particular band; and *multiband memory scan*, which allows scanning with an optional installed band.

Satellite Packet Operation

In addition to using the IC-970H for voice communications, I used the radio to copy telemetry from FO-20, DOVE, and Pacsat. Currently, I am using a PAC-COMM Tiny-2 and PSK-1 to decode the BPSK and AFSK telemetry signals from these birds with my IC-275H and IC-475H radios. To copy the telemetry using the IC-970H, I just inserted a microphone connector and connected the audio input and ground of the PSK-1 or Tiny-2 (depending upon which bird I was copying from) to the microphone connector. This provided the bare minimum connections required to perform telemetry reception. For DOVE (AFSK FM), I just tuned to 145.825 and let the bird pass over. (Here, I did not need to tune for Doppler.)

However, for the FO-20 and Pacsat satellites (BPSK SSB), I needed to manually tune for the correct Doppler-shifted signal. This

Specifications

Frequency coverage	140.1–150.0 MHz	
	430.0–450.0 MHz	
	1200 MHz Band (with optional UX-97 unit)	
	50–900 MHz (with optional UX-R96 unit, RX only)	
Tuning step increment	SSB, CW	10 Hz
	FM	5, 10, 12.5, 20, 25, or 100 kHz
	All modes	1 kHz and 1 MHz
Operation modes	SSB (A3J), FM (F3), and CW (A1)	
Power requirements	13.8 VDC ±15%	
Antenna impedance	50Ω unbalanced	
Current drain (2m)	16A on transmit	
	2.5A on receive	
Usable temperature	−10 degrees C to 60 degrees C	
Frequency stability	±3 ppm	
Dimensions	425 W x 149 H x 406 D mm	
Weight	15.0 kg (without internal power supply)	
	17.3 kg (with power supply)	
Output power	5–35W (2m SSB and CW)	
	6–45W (2m FM)	
	5–30W (70cm SSB and CW)	
	6–40W (70cm FM)	
	≤10W (23cm SSB, CW, and FM)	
Modulation system	SSB balanced modulation	
	FM variable reactance frequency modulation	
Spurious emissions	more than 60 dB below peak output power	
Carrier suppression	more than 40 dB below peak output power	
Unwanted sideband	more than 40 dB below peak output power	
Microphone impedance	600Ω	
Sensitivity	SSB and CW	<0.11 µV for 10 dB S/N
	FM	<0.18 µV for 12 dB SINAD
Squelch sensitivity	SSB and CW	<0.56 µV
	FM	<0.18 µV
Selectivity	SSB and CW	>2.3 kHz for −6 dB
		<4.2 kHz for −60 dB
	CW narrow	>500 Hz for −6 dB
		<1.3 kHz for −60 dB
	FM	>15 kHz for −6 dB
		<30 kHz for −60 dB
Audio output power	1.5W with an 8Ω load at 10% distortion	
RIT variable range	±9.99 kHz	
Notch filter range	> ± 1.2 kHz	
Notch filter attenuation	>25 dB	

Table 1. The IC-970H's specifications.

tuning is common, and can be eliminated by connecting additional lines from the PSK-1 to the ACC plug on the rear panel of the IC-970H.

The telemetry sent from FO-20, DOVE, and Pacsat did not require the use of a preamp to receive good packets. All passes I experimented with had elevations of about 25 degrees or higher, and telemetry could be decoded for about three-fourths of the entire pass. Signals were on the average of S-5, with peaks in the range of S-9 to S-20 on FO-20 and Pacsat (SSB), and full S9+40 on DOVE (FM). During these experiments, my antennas were placed to point directly west and at 0 degrees elevation. Obviously, you can get better signals if you point your antennas directly at the satellite.

CT-16 Interfacing

On the rear panel of the IC-970H, a TTL-level remote jack is provided for CI-V converters. This remote jack can also be used to track uplink and downlink frequencies with another radio, such as the IC-1271 or IC-1275 (if you already have one and don't need to buy the optional 1296 MHz module), in conjunction with ICOM's CT-16 satellite interface. This will operate in the manner described above when you are tracking uplink and downlink frequencies in the same or reverse directions.

Pros and Cons

Features I'd like to see:

- •SWR meter.
- •DTMF keypad.
- •A microphone included with rig.
- •Increased output power comparable with other H models.
- •Individually activated preamps.

Features I liked:

- •Automatic tracking for uplink and downlinks.
- •Separate memory channels for satellites.
- •Excellent weak-signal receivers.
- •Great audio quality.
- •Large frequency display.
- •Large multi-function meter.
- •Additional S-meter for sub band.
- •Large easy-to-handle controls and switches.
- •Additional band units can be installed.

It's Worth Buying

Overall, the IC-970H is a great rig for satellite communications and local activity. I found the IC-970H easy to use, and very capable of either voice or data satellite communication modes.

Contact Joe Holman KA7LDN at Box 37, Redmond WA 98073. For more information about amateur satellites and satellite operations, contact AMSAT NA at (301) 589-6062.

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73 Review *by Dick Goodman WA3USG*

Skymoon

Software for EME communications.

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Price Class: Version 1, $40; Revision 2, $50

One evening in late November 1990, I received a telephone call from Bill Brown WB8ELK informing me that Dave Blaschke W5UN was on the air operating moonbounce. Bill suggested that I try receiving W5UN on 2 meters. I was quite pessimistic about my chances because my antenna system consists of a single Hy-Gain circularly-polarized yagi used for OSCAR satellite operations. I do, however, have a low-noise mast-mounted preamp and a short (60 foot) run of RG-213 coax going to the shack, so I gave it a try.

It took about 10 minutes, but from under all the noise I was finally able (barely) to make out the W5UN's callsign on CW. It was about the weakest signal that I have ever heard, but considering that I was using a single yagi it was quite an accomplishment. I have read articles in several amateur journals stating that the big guns on moonbounce could be received on modest equipment, but I never believed it, until now!

While the "Instant Track" program gave me the azimuth and elevation of the moon, and allowed me to automatically point my antenna, I found there were quite a few other considerations not addressed by this software package for moonbounce operations.

Photo A. Main screen of SKYMOON.

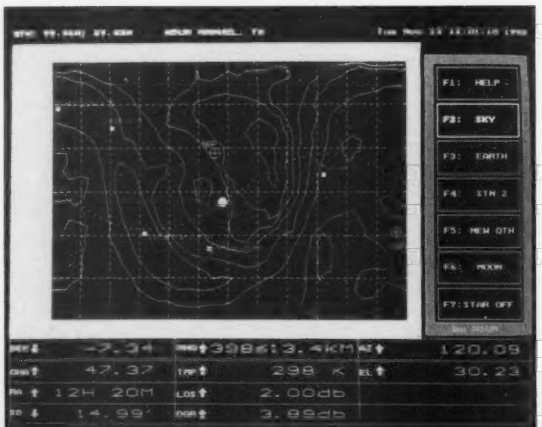

Photo B. Map showing the moon's location in relation to noise sources in the sky, as viewed from your QTH.

Enter: Skymoon

Computer software has certainly evolved in the last 10 years, especially in the field of amateur radio. Since the software developers who write ham radio applications software are usually hams themselves, they are generally technically-oriented individuals. This translates into a useful software package for others with similar interests. Look at the impact of "Packet Cluster," and the variations of logging programs on chasing DX. There are also many effective propagation forecasting programs for determining when DX will be available. For the ham interested in OSCAR operations, there are several good satellite tracking programs which will indicate when the desired satellite will be in view. Now, for the ham interested in moonbounce, or EME (Earth-Moon-Earth) communications, there is a spiffy new software package called "Skymoon," written by Dave Blaschke W5UN, of international moonbounce fame!

I reviewed Skymoon on two different computers: a Beltron AT clone running at 12 MHz with a VGA display, and a Comp-U-Add 386 running at 16 MHz using an EGA, and later a VGA, display.

There are two revisions of Skymoon. Revision 1.0 will run on any IBM PC clone with Hercules, CGA (Mode 4), or a CGA monitor. Version 1.0 comes on a single 5.25" floppy disk, and it can be executed and run from a single drive system. Revision 2.0 comes on two 5.25" floppy disks, and requires either a hard drive or a larger capacity floppy drive (720K, 1.2M, or 1.44M). Skymoon requires 256K of memory to run. For this article, I primarily reviewed Revision 2.0, but I'll provide a brief comparison to Version 1.0 later in the review.

Skymoon is easy to install—you simply copy all the files from the two floppy disks to their own directory on your hard drive. Before you run Skymoon, you must execute a configuration program. This tells Skymoon your offset to UTC, call, QTH, and latitude and longitude.

To start Skymoon, type "SKYMOON" and press <ENTER>. It takes Skymoon about 10 seconds to draw its graphical interface screen. This generates a world map showing the location of the moon and a moon rise/set line (see Photo A). To the right of the map is a menu which describes the purpose of each function key. Below the map are multiple windows of real-time data containing the following information:

- The primary station (your station) azimuth and elevation to the moon (if the moon is not in view, the elevation will be a negative number).
- The current distance to the moon in kilometers.
- The background sky temperature in degrees Kelvin. Depending on where the moon is in relation to noise sources in the sky, this value will change.
- Path loss in dB relative to when the moon is closest.
- Total path degradation in dB.
- The moon declination angle and the Greenwich hour angle (GHA).
- For those used to astronomical positioning parameters, the moon right ascension and the semi-diameter.

Next to each parameter is an arrow that gives the status of each (increasing or de-

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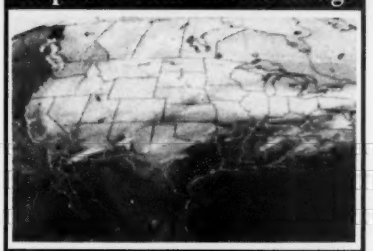

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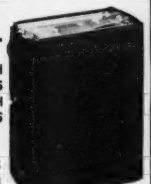

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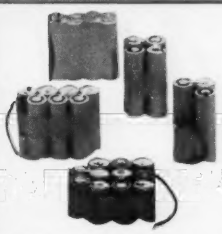

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creasing). Also, at the top left of the screen are your latitude, longitude, and location name. At the top right is a real-time clock-calendar. Using single keystrokes, this clock-calendar may be stopped, changed in time or date, and restarted. All parameters for the moon at this new time will then be displayed (this does NOT affect your DOS clock). Also included with the clock function is an "East-West Sequencer" which will, if activated, generate a "beep" every two minutes, and display either "East" or "West" on the top of the screen next to the clock. This function is used to determine when to listen or transmit when calling CQ. In Revisions 2.0 and above, pressing the "up-arrow" will generate a listing of the moon's rise and set times for the primary QTH.

The Function Keys

The menu of function keys is quite helpful. Pressing F1 will generate a help screen almost anywhere in Skymoon. F2 will present a map of the sky in place of the Earth (see Photo B). This map is formatted with contour lines of sky noise, with the moon and the path that the moon will take, superimposed over it. Changing the date (or time) will move the position of the moon to its appropriate place on the skymap. F3 will regenerate the map of the Earth.

Function key 4 (F4) is the most versatile function of Skymoon. It allows a second station to be displayed on the real-time map of the Earth, with the following parameters displayed on the bottom of the screen:

- Primary station's (your station) spacial antenna polarity.
- Second station's spacial antenna polarity.
- Antenna polarization correction angle (difference between the above two polarities).
- Antenna polarization mismatch loss in dB.

The second station may be selected by one of three methods. The first is to use the cursor positioning keys to move the "second station indicator" to the desired point on the world map. If you press <ENTER>, this point will be marked with an arrow and all applicable data will be displayed, including grid square, distance, and direct antenna heading. The second method is by direct entry of latitude and longitude. The third method is by direct entry of the grid square. Revisions 2.0 and above let you choose one of the many stations included in the EME station directory (included in this program) as the second station. This directory includes almost all known EME stations in the world, and may be accessed by callsign. Revision 2.0 also lets you compute the moon rise and set times for the second station. *[Ed. Note: Revision 2.1 is now available. Some of the new features are: rapid appearance of the Sky Map and World Map, Az/El direction to ANY point in the sky, single keystroke time changes, metric distance option (km).]*

Function key 5 (F5) will bring up a QTH menu that offers several pre-programmed locations. Choosing one of these will replace your QTH with the one selected (your QTH will be added to the QTH menu, so quick recovery is possible). The world map and related data will now be displayed for the new QTH. Revisions 2.0 and above allow access to the EME directory, and replacement of the primary QTH with any station listed.

Function key 6 (F6) toggles the moon rise-set line on or off. This would be beneficial if you are using the sun grayline function for DXing (see F7 functions).

Function key 7 (F7) is multi-functional. Press it once when the world map is on the screen and the sun symbol and grayline will appear. The azimuth and elevation to the sun will appear in the data windows below. Toggling it several times will profile high and low noise areas of the sky.

This software package also has several features that I did not try. One is the capability to add additional entries to the EME directory.

Version 1.0 of this program (for CGA and EGA) runs noticeably slower. It also doesn't contain the directory of EME stations, and does not have the moon rise-set prediction function.

All things considered, this is a well-written software package that should appeal to anyone who wants to consider EME operations. All screens are logically structured and present the data in an easy-to-read manner. The operating manual is complete and provides a tutorial that will have anyone mastering this program in less then an hour. 73

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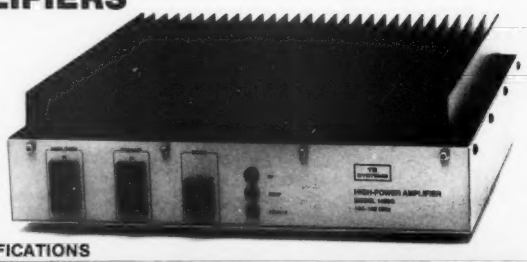

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2252G	220-225	25	220	.7	14	13.6	36	UHF
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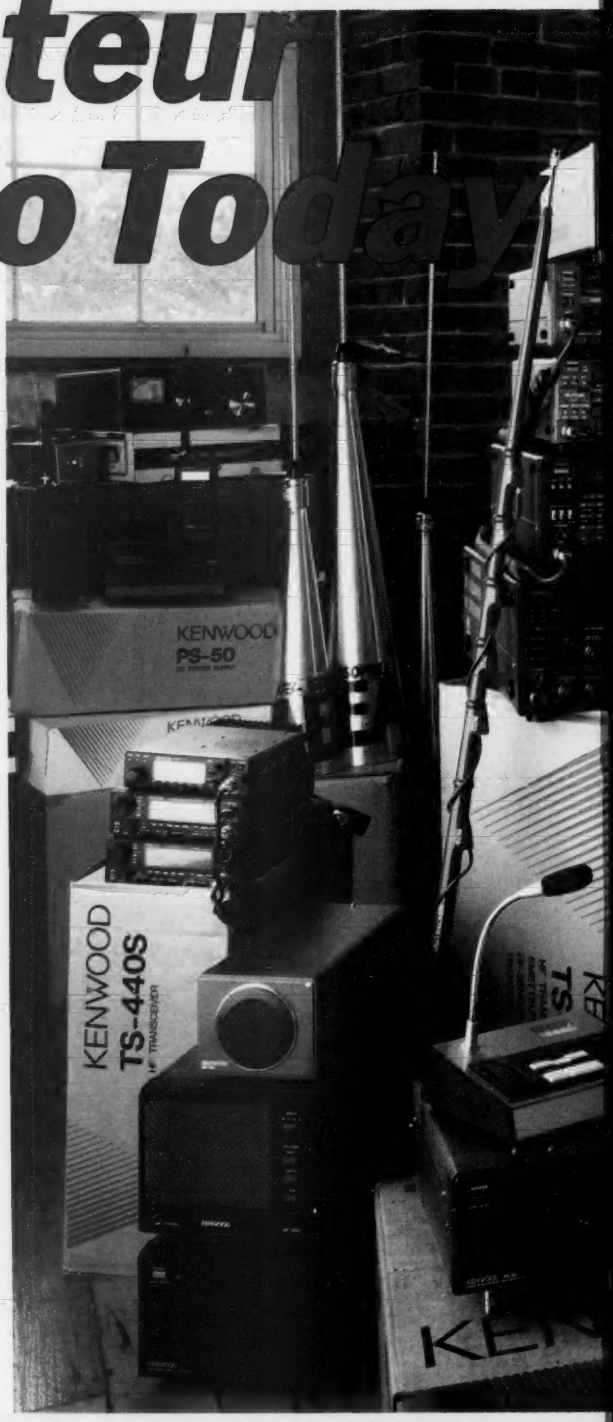

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Two Meter EME Primer

Your guide to moonbounce action!

by Dave Blaschke W5UN

Are you interested in EME (Earth-Moon-Earth) operation, but you don't know how to get started? In this article, you'll find out how to determine if your current station is capable of making EME contacts, and if not, what improvements you'll need to make if you want to hear and work EME stations. You'll also learn basic operating information and procedures. You may be surprised to find that if you're willing to spend a little effort, and believe you can do it, it's not impossible to get involved in this exciting area of amateur radio!

EME communications experiments were first conducted by amateur radio operators in the late 1940s. It remained a curiosity and experimenter's mode for many years because most 2 meter stations had poor antennas and noisy receiver front ends. All of that has changed in recent years. Now, almost anyone capable of putting together a reasonably sized station on 2 meter CW can share in this exciting and challenging form of communications.

Photo B. The W5UN EME array is rotated via 2 truck chassis (powered via an electric motor on the driveshaft of one of the vehicles) which literally drive the antenna around a large circular roadbed. The array pivots around a rotating pole in the center. An electric winch along with a series of pulley and cables provide elevation control.

You May Be Set Up Now

In fact, I have discovered that there are many amateur stations currently active on 2 meter CW that are capable of making EME contacts, but they haven't tried it because they don't know they can do it. I've spoken with some who are hard pressed to believe that they are capable of performing such a seemingly impossible feat. But I can assure you that anyone who has more than 100 or 200 watts of power, and an antenna with 16 or more elements, can expect to make a few EME QSOs on moonrise or set, without further station improvements.

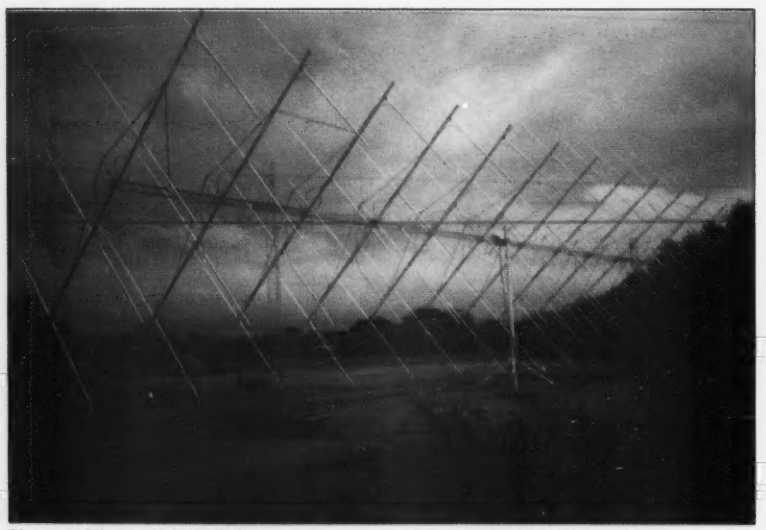

Photo A. The new W5UN EME antenna array providing 30.75 dBd of gain (the old array was destroyed by a tornado last March). Dubbed the "Mighty Big Array" or MBA, it consists of a total of 48 stacked long boom yagis (modified M² model 2M5WL).

For the smaller stations who can only run 100 watts or so of output power, a good antenna, which can now be easily built or inexpensively bought, is probably the only other thing needed to accomplish half a dozen EME QSOs. Nowadays, the only amateurs with no chance to participate in EME work are those who run FM only, have only vertical antennas, or use only HTs.

Several hundred amateurs worldwide, many in Europe, are currently active and regular on 2 meter EME. New stations are appearing almost daily. Stations with large antennas and high power, such as my own

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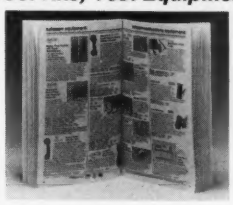

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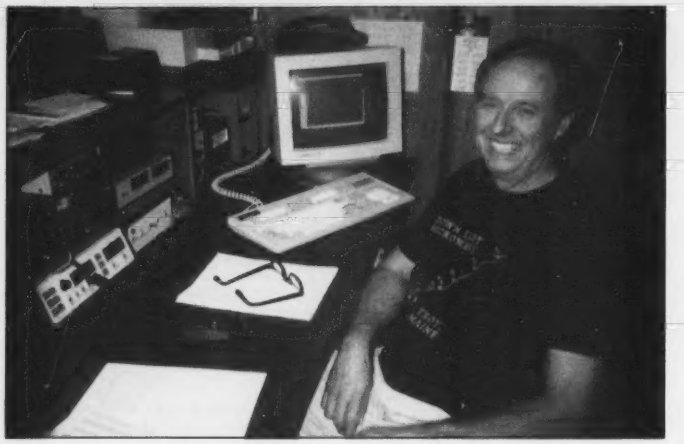

Photo C. Dave Blaschke W5UN at the control of his moonbounce station after working VS6BI and J79/W6JKV for countries 100 and 101 on October 28, 1990. It took him eight years to reach the century mark (his first EME contact was with K1WHS in 1981). He's currently up to 105 countries worked after contacting CE0ZZZ, 9M8SEA, 7P8EN (Lesotho) and ZS9Z (Walvis Bay). [Ed. Note: Looks like EME could be a great way to avoid those pile-ups to work those rare ones!]

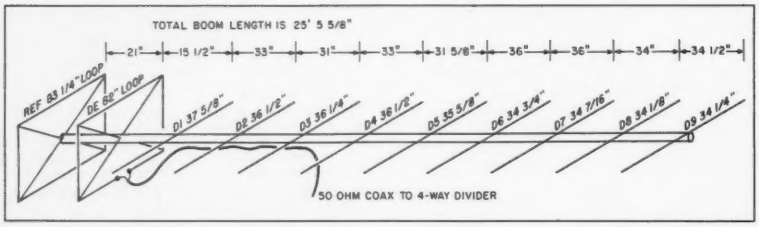

Figure 1. Modified W5UN quagi (optimzed for 144.050 MHz - gain of 13.25 dBd). All directors are ⅛" solid aluminum rod cut to within ±1.16". Reflector and driven elements are shaped into square loops using number 12 solid copper wire with TW type insulation. Leave the insulation in place. Boom is either non-conductive sealed wood or Fiberglas™.

station, W5UN, make it possible for small stations to make EME QSOs today (see Photos A and B).

After *QST* published the article about W5UN's Texas MBA (Mighty Big Antenna) in the January 1989 issue, I was deluged with requests for information and schedules by amateurs who knew nothing about EME communications. Most who wrote or called me had never listened for return echoes before. EME communications requires more structured operating procedure and equipment specifications. For example, antennas must be reasonably sized, and receiving systems must have fairly quiet, sensitive front ends.

Antennas

The first, and most important, piece of equipment needed for EME work is an adequate EME antenna system. Such a system is defined here as one having sufficient elements, properly spaced and phased to yield the gain required for successful EME communications. (Path-loss formulas can give you an idea of the power and antenna gain required.) To communicate by moonbounce, you must be heard by, as well as be able to hear, other moon-reflected signals. It is not known precisely what the minimum gain of an antenna needs to be, but based on a lot of operating experience, I have found that the minimum gain stations need in order to be heard by my station reliably, is around 13 true dB referenced to a dipole when transmitter power into that antenna is no less than 100 watts.

Such antenna and power will permit W5UN to hear you during most of the schedules you're likely to run. A random QSO with W5UN is even possible if a small station calls until heard (this might take weeks or months, but it *is* possible).

"What kind of antenna do I need for an EME station?" is an often-asked question. EME stations use many different types, but the long boom yagi is the most popular. By long boom, I mean boom lengths greater than four wavelengths (about 27 feet). Several of this type are sold commercially. A few which come to mind are the KLM17LBX, Cushcraft 32-19, 42-18XL, Cu-dee, F9FT, and the M² 2M5WL.

For those who find commercial antennas a bit too much for the budget, an inexpensive long boom quagi, with the necessary gain for EME listening and a few QSOs, can be homebrewed (see Figure 1).

Due to computer modeling, advances in design have changed older home-brew antenna dimensions, resulting in better performance. So, if you are contemplating building your own EME antenna, please keep this in mind, and make sure the design you are going to build has been properly modeled and range-tested to ensure optimum performance.

It is possible for stations using OSCAR satellite antennas to hear EME signals from the very large stations. Stations using these antennas have been challenging for W5UN to hear. However, it can be done if such stations will make EME schedules in advance. Recent OSCAR antenna stations worked on schedule by W5UN were CE0ZZZ (KLM22C and 170 watts), KB6BA (KLM22C and 300 watts), and 9M8SEA (unknown OSCAR antenna and 300 watts). The problem with most satellite antennas is that they have circular polarization. This reduces the signal by 3 dB for EME stations, who nearly always use linearly polarized antennas.

The key to all of this is that whatever type of antenna you choose, it must work at its peak capability. Feedline losses, misphasing, and other problems will reduce its effectiveness.

Power

High power is preferred because most stations cannot put up large-sized arrays to make

TIME	FIRST 1½ MIN	LAST ½ MIN	COMMENTS
0000—0002	W4ZD de ZD8MB	W4ZD de ZD8MB	Initial transmission
0002—0004	ZD8MB de W4ZD	ZD8MB de W4ZD	Nothing hrd yet by ZD
0004—0006	W4ZD de ZD8MB	OOOOOOO	MB heard calls from ZD
1006—1008	ZD8MB de W4ZD	ZD8MB de W4ZD	ZD didn't hear calls
1008—1010	W4ZD de ZD8MB	OOOOOOO	MB still needs RO's
1010—1012	ZD8MB de W4ZD	ZD8MB de W4ZD	ZD got O's but not calls
1012—1014	W4ZD de ZD8MB	OOOOOOO	MB waiting for RO's
1014—1016	RO RO RO RO RO	RO RO RO RO	ZD got calls and O's
1016—1018	W4ZD de ZD8MB	OOOOOOO	MB didn't hr ZD's RO's
1018—1020	RO RO RO RO RO	RO RO RO RO	ZD sends RO, needs R's
1020—1022	RRRRRRR	RRRRRRR	MB heard RO's, sends R's
1022—1024	RRRRRRR	73 73 73 73	ZD completes the QSO

Table. Example of a scheduled EME contact between W4ZD in Florida (western station) and ZD8MB on Ascension Island (eastern station).

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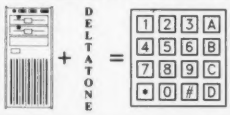

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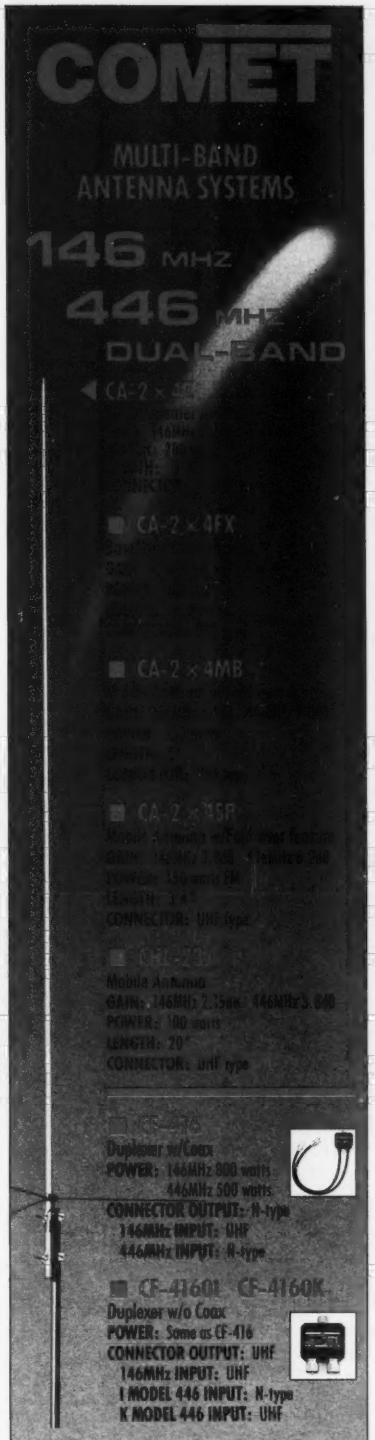

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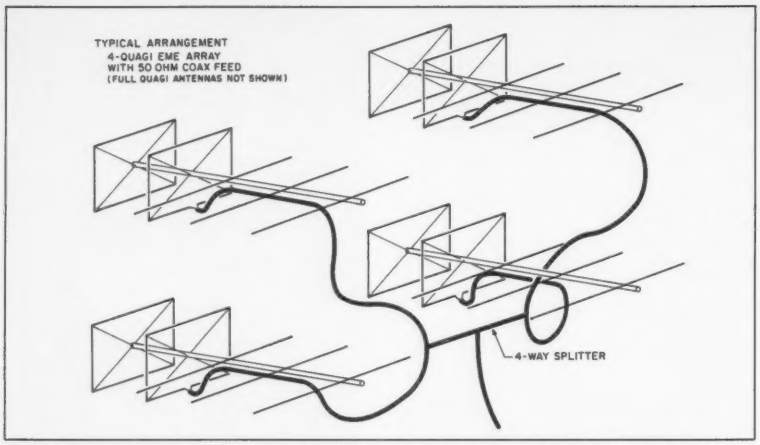

Figure 2. Four quagi EME array with 50 ohm coax feed (full quagi not shown in drawing).

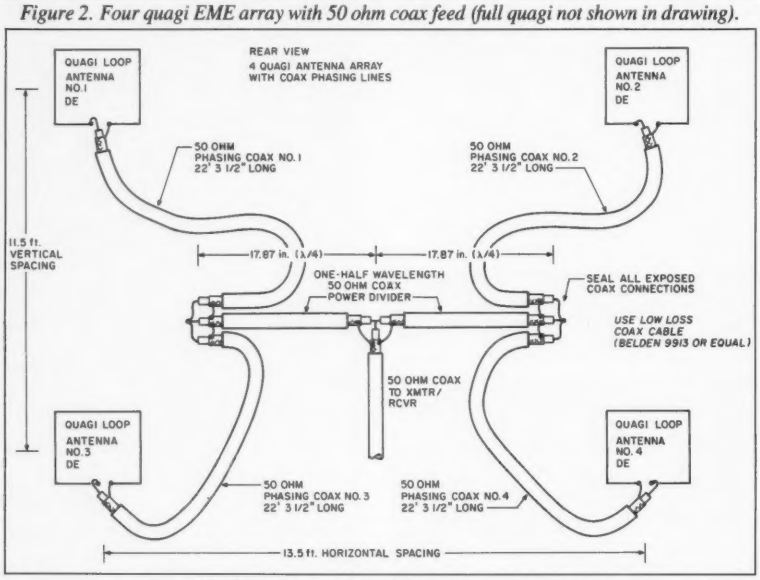
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Figure 3. Coax phasing details for the 4 quagi EME array.

up the difference in signal strength levels for EME work. Four good long boom antennas properly spaced, phased, and fed with 500 watts or more, will permit one to make many routine, random EME QSOs on 2 meters. The number of contacts possible with such a station depends upon operator determination and effort.

What is the lowest power station that you can have and still hope for an EME QSO? Well, I have worked a couple of stations who were using a single long boom antenna and running less than 50 watts. In one such contact, W2RS, running 50 watts into a single Cushcraft 32-19 antenna, answered my CQ. I worked another station, ZD8MD, during a schedule. He was running 25 watts to a single 32-19. With higher gain antennas, such as the 42-18XL and the 2M5WL, these contacts could be easily repeated if peak conditions happen to coincide with the schedule time.

Preamplifiers

Your receiver's front end noise figure must be kept below 2 dB if you want to hear those weak moon echoes. If your receiver's front end is not that sensitive, do not despair, a good low noise preamplifier between the antenna and the receiver will perk it up to an acceptable level. Such preamps can be bought or built. They work best if they use GaAsFET transistors, such as the MGF 1302. They also work better when mounted at the antenna, where feedline losses cannot degrade their performance. If antenna mounting is used, some form of relay switching and front end protection must be provided, lest the preamp be blown out by the transmitter power. Many of the solid-state "brick" amplifiers have preamps installed. While these are not usually the best (a preamp with a low noise GaAsFET is the best) they are usually good enough to let you listen to the larger EME stations when conditions are good.

Avoid the use of bipolar transistor preamplifiers. Even though some of these devices can yield noise figures of less than 1 dB, they are susceptible to intermodulation problems, and in some locations can cause birdies to appear all over the 2 meter band. They may work fine if you happen to live in the South Sea Islands where there are no other RF signals, but otherwise, avoid them.

Coax Feedlines

On receive, feedline losses can be overcome by installing the preamp at the antenna. Feedline losses reduce the power transmitted to the antenna, and putting power into the antenna, not out of the transmitter, is what counts in EME work. For example, 100 feet of regular RG-8 coax will have nearly 3 dB of loss at 2 meters.

That means if you start with 100 watts output from your amplifier, you will get only 50 watts into your antenna. Use the shortest possible length of high quality, low loss coax. Your feedline losses should be kept less than 1 dB. As a rule of thumb, Belden 9913 is fine up to 50 feet. Half-inch hardline is good up to about 75 feet. Three-quarters of an inch hardline will work to 175 feet. Beyond that, you will need the bigger stuff. I use a 190 foot length of 1⅝" Heliax from the amplifier to the antenna. Its loss is less than four-tenths of a dB.

Be careful about connectors and power dividers. Losses can increase if a poor connection occurs, or if water gets into connections and power dividers.

Amplifiers

The minimum power you should consider for EME work is about 150 watts. Some commercial solid-state brick amplifiers will produce this. The output of two such bricks can be combined to double the power output, but this can be tricky. If you plan to try it, get the proper information to do it right. For a more serious EME effort, power of 500 watts or more is recommended. Commercial amplifiers are available with power outputs of 1 kW and more, if you're ready for that. Many EME operators have built their own power amplifiers. *The ARRL Handbook* is a good reference for home construction. Sometimes kits are available.

Remember, you do not need high power to start listening for EME signals, or to make contacts with the large moonbounce stations.

Where, When, and How to Listen

EME work on 2 meters is primarily done on CW, sometimes on SSB, but never on FM. Signals are very weak echoes reflected from the moon's surface. To hear such signals requires a receiver with a reasonably low noise front end (most commercial receivers are not good enough, but a relatively low cost preamplifier can fix that). A well-designed antenna in good working condition must be pointed at the moon. This can be done without elevating the antenna if you can catch the moon during the hour or so after it rises, or before it sets. In fact, when there is EME activity, these are the best times to hear EME echoes using a rotatable antenna that cannot be elevated. If your horizon is relatively clear and flat, ground gain enhancement is possible during rise and set periods. Moderate EME activity occurs often on weekends when the moon is

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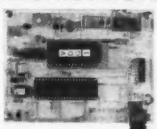

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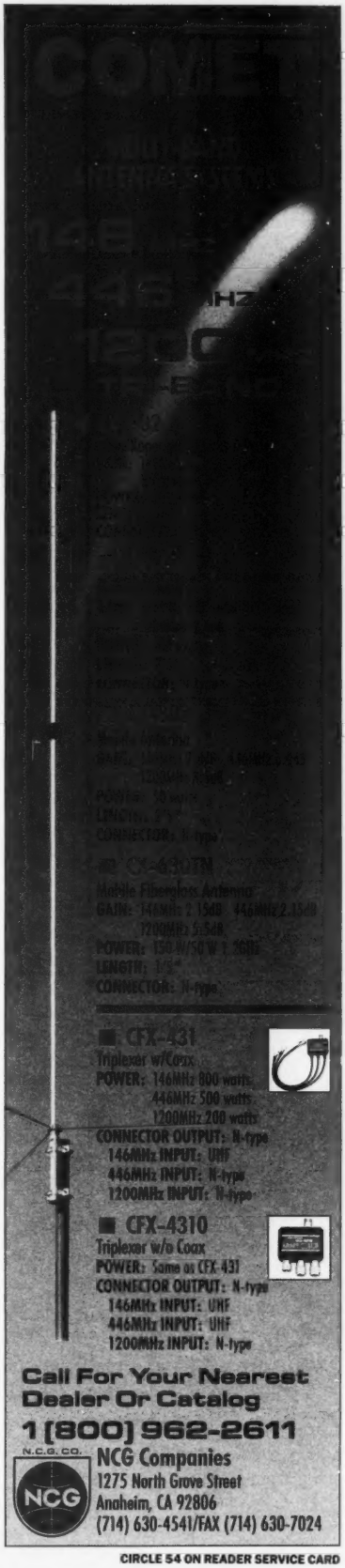

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in a favorable sky position. Activity peaks when the moon is within common view of both Europe and North America. Random activity can be found from 144.000 MHz to 144.020 MHz. Schedules are run between 144.020 MHz and 144.100 MHz. Single sideband voice is sometimes heard on 144.105 MHz. I usually operate CW on 144.008 MHz during such times, and also on weekdays after work. Many CQs are called by myself, W5UN, and others during these times.

Schedule Making

EME operation is either random (calling and answering CQs), or scheduled. Let's discuss schedule operating procedures first. Schedules are made in several ways. The best way is to check into the 2 meter EME net beginning around 1730 UTC every Saturday and Sunday on 14.345 MHz. Direct telephone calls to the station you want to make a schedule with is another way. I've set up many schedules with small stations this way. A third way is to request a schedule by mail.

Schedules usually last for one hour, but may be longer or shorter as agreed to by the participants. Smaller stations usually run schedules for one hour. During schedule making, a frequency and time are agreed on, and the two running stations are designated as being either east or west, depending on their relative location to one another. When a schedule begins, the eastern station transmits for the first two minutes beginning at the top of the hour. If the schedule starts at a time other than the top of the hour, the same two-minute periods are used as if the schedule had started on the hour. If you are running a schedule with a station to the east of you, that station would be the eastern station, and you would be the western station. The two-minute transmit/receive sequencing will continue until the schedule is completed or until time runs out.

For successful 2 meter EME QSOs, you're required to exchange callsigns, O's, RO's, and R's. This data must be received and acknowledged by both stations. 73s are usually sent also, but this is optional information. Let's consider a schedule example.

The table illustrates how a schedule between W4ZD in Florida and ZD8MB on Ascension Island might progress, and shows how the information discussed above is handled. Let's say they have a one-hour schedule starting at 1000 GMT. ZD8MB is east of W4ZD, so he is designated as the eastern station, and will transmit the first two minutes. ZD8MB will send calls over and over for the full two minutes (W4ZD de ZD8MB).

W4ZD begins sending at 1002 GMT. If W4ZD heard the calls, he will send ZD8MB de W4ZD for the first minute and a half, and O's for the last half a minute. If W4ZD doesn't hear both calls, he calls only for the full two minutes. This continues until either station has heard both calls and O. Once an O is heard, the station hearing it responds with RO's during his next transmission for the full two minutes. The station copying RO's has received sufficient information for his part of the QSO. When the station transmitting RO's hears an R, that station has received sufficient information for his part, and the QSO is essentially complete. Most stations, upon hearing R's, will respond with R's and 73s to let the other station know that R's have been received.

Random QSOs

Having read all that about two-minute sequences, you will find that a lot of random activity is conducted with one-minute sequences. In fact, nearly all my random QSOs are of the latter type. If stations are hearing each other well enough to copy random calls in one minute, additional time is not necessary.

Random activity is quite a challenge for the less equipped, smaller station. However, by answering the CQs of larger stations transmitting on the bottom 20 kHz of 2 meters, it is possible to make QSOs. It is well-known that the signal level of a scheduled station can be several dB less than that of the weakest identifiable random calling station. A listening operator can mentally fill in the missing parts of a very weak station's call when he already knows what the call will be. Also, when the operator knows a certain station will be calling on schedule, he shifts his ears (and brain) into a more focused, selective mode in order to dig that station out of the noise. For these reasons, small stations are urged to make advanced schedules whenever possible. However, don't give up on answering random CQs, because you never know if success is possible until you try.

I must tell you one more thing about schedules and the pre-knowledge of callsign information: It takes discipline to assure yourself that you're hearing what you think you're hearing when you dig deep into the noise for long periods. Some operators can manage this self-discipline better than others. Remember, you will only shortchange yourself and the station you are scheduling if you acknowledge QSO information that you have not truly heard, but only thought you heard or, worse, have guessed at. This is another reason why I enjoy random operation: I don't have to be as disciplined about what I thought I heard, since I actually must hear the full call to know who is calling.

The Effects of Conditions

A signal of constant strength transmitted from Earth and then reflected back never yields the same signal level in a receiver from one moment to the next. There are many factors which cause this phenomenon. Some of these factors are well understood and predictable. Some are only partially understood and are not so predictable. There are probably a few factors that haven't even been thought of yet. Some of the signal variations are short-term (such as those caused by moon/Earth libation), and some are long-term, such as those caused by Earth/moon distance separation. Libation effects are very short-term (milliseconds) and are of little interest to EME operators. Longer-term factors are of great interest because EME scheduling and operation times are chosen based on a set of such predictable factors. I will explain these factors shortly. There are also some factors which cannot be predicted in advance, but which can greatly affect EME communications. I will briefly discuss these also.

The distance of the moon from Earth, the position of the moon in the sky (that is, the background sky when looking at the moon), and the phase of the moon during its 29-day cycle all have well-known effects on reflected echo strength, relative to system noise. During the 29-day cycle the moon ranges from apogee (furthest from Earth) to perigee (nearest to Earth). At apogee, the strength of a returning echo will be about 2 dB less than it will be at perigee, all other things being equal (which they seldom are). Also, during the 29-day cycle of the moon the background sky noise levels at 2 meters will vary from 175 degrees to over 5000 degrees Kelvin. (The higher noise occurs when the moon is positioned against the galactic plane, which happens near the moon's most southerly declination.) This noise equates to dB readings from 1.75 dB to over 10 dB. Sky noise and path loss are the key data elements used by EME operators to determine the best operating times during the moon cycle.

Factors affecting the moon which are not so easily predictable are the effects caused by the Earth's geomagnetic field as the signals pass through it on the way to and from the moon. One such effect is Faraday rotation. This causes the polarity of signals to rotate from horizontal to vertical and back. Faraday rotation can cause a signal to null-out (or peak) depending upon what type of polarity your antenna has. Polarity seems to rotate quite naturally at about 15 minute intervals when the geomagnetic field is normal. However, things are seldom "normal" with the geomagnetic field (despite what WWV says), and sometimes rotation locks up for long periods of time. Another situation caused by geomagnetic activities is where signals seem to be dispersed or absorbed, rather than rotated. At such times, it doesn't seem to make any difference what your antenna polarity is. Even if you could rotate polarity (as some stations can) it wouldn't help. I have also heard signals greatly enhanced in strength when the geomagnetic field was disturbed, although many times when this happens, communications is one-way, and stations at more northern latitudes will hear nothing for long periods of time. Then the situation reverses, and the southern stations are locked out. So, it is difficult to determine in advance just what the effects will be for a given time and condition. There is still a lot to be understood about such effects on EME communications before predicting methods can take them into account.

There are are a few other rules of thumb about EME operating conditions. Overall, nighttime seems to be better than daytime for EME operation (perhaps because ionization and consequent absorption is less of a problem). But I have heard some very good condi-

tions during daylight, so don't give too much weight to this. Winter, on the average, seems to have better EME conditions than summer, probably for similar reasons.

The new moon can affect EME communications. Noise from the sun will mask weak signals during new moon. The moon is not usable for EME work for about two days centered around the new moon date. There will be many days during the cycle when the moon cannot be seen because it is up during daylight. EME communication is quite possible most of these days, if you can aim your antenna without seeing the moon.

Computer Programs

A number of programs that compute moon-tracking data, essential to scheduling and antenna-aiming, run on ham shack computers. The best of the more modern programs run on IBM personal computers. Other computer software for Commodore computers, HP calculators, and others, can still be obtained, or even easily written.

Good moon tracking programs, such as W5UN's SKYMOON, VK3UM's REAL-TRACK, and WA1JXN's TRACKER, will give excellent directional antenna-aiming and a lot of other pertinent EME data. *[Ed. Note: see the review of SKYMOON in this issue]* Many EME operators use such programs to find the moon's azimuth and elevation (Az/El) from any given point on Earth at any given time, so that they can arrange mutual schedules. In addition to moon position, these programs give moon apogee and perigee information, and moon background sky noise estimates for each Az/El time interval calculation. Some programs go beyond this and also compute many other variables of interest to EME operators.

EME Directory

"The EME Directory," available from Bev Cavender W4ZD, P.O. Box 88, Lake Placid FL 33852 is a good resource to have if you wish to know who the worldwide, active EME stations are, and what kind of station equipment they are using. The directory is also part of revision 2 of the SKYMOON program.

2 Meter EME Newsletter

"The 2 Meter EME Newsletter," published by John Carter KØIFL, P.O. Box 554, Union MO 63084 about 10 times per year, helps keep EME operators informed about who is active on EME, and who is working whom.

2 Meter EME Net

As I mentioned previously, the 2 meter EME net meets every Saturday and Sunday around 1730 UTC (after the 70cm net finishes) on 14.345 MHz SSB. This is the "watering hole" where EMEers gather to exchange information and make schedules. Newcomers are welcome to check in. VE7BQH is net control.

Dave Blaschke W5UN can be reached at 9102 Kings Drive, Manvel TX 77578.

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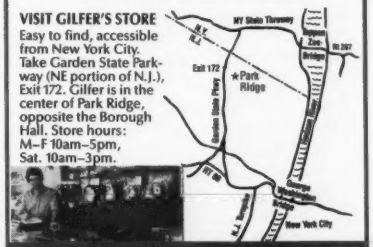

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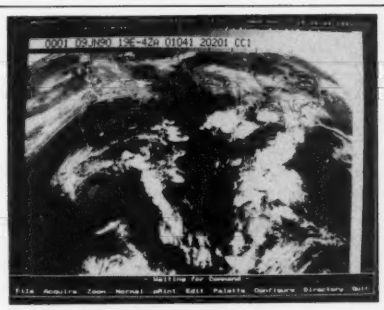

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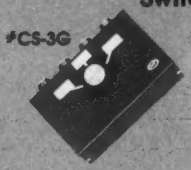

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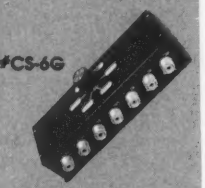

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Hams in Space!

SAREX II, the next generation.

by Philip Chien

At 1:41 a.m. on December 2, the night sky lit up over Florida with a spectacular display of flame and smoke as the Space Shuttle Columbia headed for orbit. After a series of delays (caused mainly by a persistant hydrogen fuel leak), STS-35 and SAREX II-01 was finally on its way! STS-35's primary mission was to carry NASA's Astro-1 spacelab with three ultraviolet telescopes to observe the universe in ways never viewed before. Operating NASA's own Goddard Spaceflight Center's Ultraviolet Imaging Telescope (UIT) was payload specialist Ron Parise WA4SIR. In 1978 UIT astronomer Ron, a ham since 1962, was completing his graduate studies at the University of Florida, and by 1980 he was part of the UIT team. Little did Ron realize then that he'd be flying with the UIT instrument he helped develop.

The UIT is best described as a sophisticated telephoto camera with super-sensitive film and a violet filter. Imagine a telephoto camera with a field of view 25% wider than the full moon with ultra-low-light film with an effective ISO (ASA) of a couple of hundred thousand (in comparison with the 100–400 film you'd normally purchase). It has a filter so violet the human eye can't see it, further into ultraviolet than Hubble's capabilities. Also, instead of an 18 or 36 exposure roll of film, you have a film pack with over 1000 exposures of 70mm film! That's one heck of a telephoto camera!

SAREX II

The launch of the Astro 1 mission marked the beginning of a new series of SAREX (Shuttle Amateur Radio EXperiment) flights.

The primary mission of this SAREX was to communicate with a number of classrooms across the U.S., as well as to provide hams worldwide a way of directly connecting up to the shuttle via a packet radio robot.

In addition, Ron recommended trying ship-to-ship contact between *Columbia* and the Soviet space station *Mir*. He said, "The idea came to me some time ago, just because here was *Mir* operating 2 meters and we were going to be operating 2 meters, and we ought to talk to each other."

Any *Columbia*-to-*Mir* contact would be much easier from the Soviet side than from the U.S. because *Mir's* ham shack includes a 25 watt transceiver and an outside antenna, while the *Columbia* has an inside antenna and 5 watt transceiver.

Contact between the two vehicles is complicated by two factors. The most obvious problem, the Doppler shift, actually turns out to be fairly insignificant. More complicated is the motion of the two spacecraft. Since the spacecraft are in different orbits at different altitudes, and traveling in different directions, the range between the spacecraft and the line of sight angle changes quickly: One minute you're several thousand kilometers from each other, the next you're right next to each other, and then you're several thousand miles away again.

Photo A. Ron Parise WA4SIR working the world from the SAREX operating position onboard STS-35. Photo courtesy of NASA.

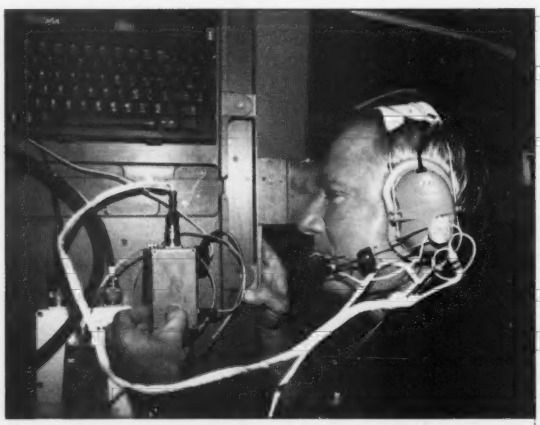

Photo B. Mission commander Vance Brand talks with family members via the SAREX 2 meter link. Photo courtesy of NASA.

Low Inclination

Unlike the earlier ham radio shuttle flights, Astro was launched into an orbit with an inclination of 28.5 degrees, the typical orbit for most shuttle flights. Spacecraft launched to the east gain extra payload capacity due to the Earth's rotation: A spacecraft launched due east can carry the most payload; the orbit is inclined to the equator at the same angle as the latitude of the launch site. The end result is that Astro flew no further north of the equator than the KSC launch site, and at the same latitude to the south, 28.5 degrees. The Spacelab 1 mission with Owen Garriott W5LFL and Spacelab 2 with Tony England WØORE flew into higher inclination orbits for better Earth observation capabilities, the trade-off being less payload.

The irony is that the Soviet space station *Mir* is in a 51.6 degree orbit, halfway between the Spacelab 2 and Spacelab 1 orbits. Had Astro been launched into a higher inclined orbit, longer opportunities for *Mir* contacts could have been possible.

Photo C. Matt Flagg, a senior at New Prairie High School in New Carlisle, Indiana,and Jim Fonte KK9T (r) make the first school contact with WA4SIR in the shuttle Columbia. Teacher David Washburn WB9QJL (l) looks on during this historic contact. Photo by Steven Peterka WD9FGZ of the News Dispatch.

Due to the 28.5 degree orbit and Ron's schedule, he was awake primarily when flying over Australia, South America, and Southern Africa; however, Astro's altitude made it possible for most continental U.S. hams to contact SAREX within line-of-sight requirements, even though it was at relatively low angles.

Schools and Packet

Since the 1985 Spacelab 2 flight, many improvements have been made to the space ham equipment, expanding the capabilities for SAREX contacts. For example, the original antenna on Spacelabs 1 and 2 could only be used in the overhead windows, which interfered with Earth observations. The new antenna (made by the Motorola Amateur Radio Club in Shaumburg, Illinois) mounts in a side window where it's out of the way and doesn't require any particular orientation. Ron did have minor problems moving the antenna across the flight deck, crowded as it was with crew and equipment, to other windows, but he managed to do it without interfering with Astro operations.

In this latest mission, relay links with teams of Australian, South American, and South African hams relayed the SAREX signals back to classrooms via an elaborate telephone/radio linkup. Most important for computer-oriented hams was the addition of the packet mode, including the capability to operate SAREX in its robot mode continuously during Ron's shift without interfering with his other responsibilities. The packet TNC was a Heath HK-21 with special robot software written by Howie Goldstein N2WX.

As it turned out, Astro was launched just a couple of hours before the Soviets launched their TM-11 mission with Victor Afanashev and Musa Manarov, a handle familiar worldwide with hams. He flew a year-long *Mir* mission in 1988 as U2MIR/UV3AM.

Record Numbers in Space

The dual launches on December 2, 1990, resulted in 12 people in orbit at the same time in three separate spacecraft: seven Americans aboard *Columbia*, two Soviet long-term cosmonauts finishing their mission aboard *Mir*, two Soviet long-term cosmonauts starting their mission, and a Japanese journalist aboard the TM-11 Soyuz spacecraft.

On the second day of the *Columbia*'s mission, *Mir* passed within 50 km. Mission specialists Jeff Hoffman and Mike Lounge said that *Mir* looked like a moving star. Unfortunately, they couldn't attempt a 2 meter contact because the Soviet crew was busy performing their post-docking tasks. Since contact would be possible *Mir* later in the mission, the attempt was rescheduled.

First Contacts

While the Astro crew didn't get a chance to talk to *Mir*, thousands of ground-based hams around the world were able to communicate with Ron Parise aboard the *Columbia*. Hundreds of students, teachers, and individuals spoke with him directly during brief contacts. Ron used some of his spare time, before sleep and after waking, and before going on 12-hour duty, to communicate with the world. He operated SAREX every time he had a couple of spare minutes.

After Ron got a chance to set up the SAREX gear, he prepared for his first voice contact as he passed back over the Kennedy Space Center launch site. His first voice QSO was with NZ8W, a ham operating a 45 watt car rig outside a hotel near the launch site. Appropriately, NZ8W happens to be Henry Parise, Ron's dad.

Due to the tight crew schedule, the other astronauts didn't get a chance to use SAREX much except for pre-planned phone patches with their families.

One of Ron's more unusual voice contacts was with mission manager Jack Jones KC4IWU. Normally mission managers only talk to the crew through the spacecraft controllers and capcoms, but Jack went over to the Marshall Spaceflight Center's ham shack and talked with Ron for a couple of minutes about how well things were going, and how proud the ground team was of the job the crew was doing.

One lucky young ham in Hawaii, newly upgraded to Technician, contacted Ron. Thoroughly enjoying himself, Ron talked for a couple of minutes about activities aboard the shuttle. Unfortunately, due to technical

Photo D. Charley Shumaker N8IKP, Barbara Curry N4TCC and Ron Curry WA4GSS (standing left to right) discuss the joys of amateur radio with students of several schools from the Huntington, West Virginia, region just prior to making contact with STS-35 during 2-way session number 3. Photo courtesy of Ron Curry WA4GSS.

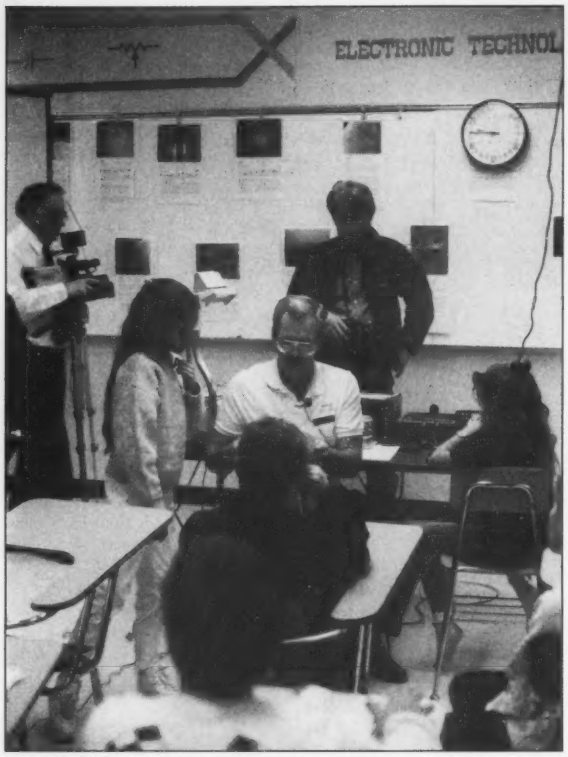

Photo E. Fifth grader Crystal Stuart of Everett, Washington, anxiously waiting to talk with WA4SIR. Thousands of students in the Mukilteo School District #6 listened in via 2 meter rigs, donated by ICOM, located in many area schools. The Evergreen Intertie (linked repeaters connecting the northwest U.S. and Canada) allowed students in Washington, Oregon, Idaho, Montana and Canada to listen as well. Photo courtesy of Larry Luchi W7KZE.

problems aboard the orbiter, Ron wasn't able to record the conversation or copy down the callsign. If you're that ham or know who it was, please contact Ron!

During the mission Ron had the chance to make several sets of voice passes over the U.S., a couple of passes over Australia, and two over South Africa. Ron even made contacts with some portable rigs. When Ron tried a few free-for-all uplink contacts, literally thousands of hams transmitted at once on one uplink frequency. Ron said at times it sounded just like white noise on his end.

Besides individuals, Ron made 28 prearranged contacts with student groups around the country, primarily via voice relays through Australia (VK2AS, VK5AGR and VK6IU) or Brazil (PY2BJO), although one contact was made directly from the *Columbia*. One of the teachers at Tampa Palms Elementary School in Tampa Florida is Cathy Blair, astronaut Sam Durrance's sister. At 8:42 p.m. EST on December 8 (6 days 18 hrs. 55 minutes MET), Ron called Lee Paulet KB4FBX, who had set up a rig in the schoolyard with the assistance of Robert Osband N4SCY. With the help of two other hams, N4SCY provided a real-time computer display showing the shuttle's position.

After Ron made the initial contact with Lee, he passed over the handset to Sam, who talked to the students for about four minutes, before the shuttle went out of range. Ron said, "It was natural to let him [Sam] talk to the kids and answer the questions."

Though it was a Saturday evening, approximately 200–300 students came over with their families to hear the shuttle in person. Local and regional newspapers, radio stations, CNN and television stations from all three networks covered the contact. Several students asked Sam questions about life aboard the shuttle, and everybody was entertained—and educated. While the contact took up four minutes of valuable shuttle time, it helped educate hundreds of students, and indirectly affected thousands of others who learned about this SAREX contact with a small elementary school in Florida. This is one of the fine examples of how the SAREX experiment has helped educate the public about the space program and ham radio activities.

Packet Robot

One of the most exciting aspects of the flight was the capability to operate the SAREX experiment almost 16 hours a day, even when Ron was on duty. Packet radio made it possible for Ron to leave the rig running as a mini-packet BBS while he was busy working with the Astro telescopes. (For details about SAREX hardware and procedures, see the article "SAREX-90" in the May '90 issue of *73 Magazine*.)

The SAREX TNC held two lists of contacts: a work list with a capacity for 600 confirmed QSOs, and a heard log for up to 32 incomplete QSOs.

The work list holds the names of the 238 lucky hams who completed the entire contact, acknowledgment, and receipt of acknowledgment procedure (see "Hamsats" in this issue). The heard log held the last 32 hams who made contact, but who hadn't completed the entire procedure. The heard log was broadcast as a QRZ beacon with its current list. Whenever Ron got a chance in between observations on the shuttle's flight deck, he would go down to the middeck where the SAREX experiment was located and dump the heard log from the TNC to the PGSC (Payload General Support Computer), a modified GRID laptop computer. The PGSC, onboard the shuttle since 1983, has proven itself so useful in monitoring experiments and collecting data that NASA is planning to replace the French-built DDS (Data Display System) Spacelab computers with them.

Ultimately, Ron got 672 callsigns in the stored heard log, including duplicates. The ROBOT's counter exceeded 1700 contacts. Unfortunately, he couldn't constantly dump the log, and it kept overflowing. The only record of the lost log entries is the QRZ beacons, and they're needed to reconstruct the log. Ron told me, "We need any QRZ beacons that anybody's got on disk or in hardcopy." If you've received and copied a QRZ beacon PLEASE send a hard copy to the ARRL, 225 Main St., Newington CT 06111. Or send it via packet to *SAREX @W3IWI.MD.USA* or SMTP Internet mail to *SAREX@TOMCAT.GSFC.NASA.GOV*.

Astro's final target, the comet Levy, was high-risk. Ironically, each of Astro's launch attempts involved a comet: Halley's in 1986, Austin in May 1990, and Levy in September 1990. When Astro was launched in December, Levy was too close to the sun to permit safe observations. However, the managers decided to attempt observation of Levy, since, as the last target for the mission, it wouldn't matter if the sensors were overloaded.

Unfortunately, while everything was working fine in orbit, the weather on the ground didn't cooperate. Mission controllers decided to bring *Columbia* back a day early to avoid the bad weather.

A more important impact to the reduced length of mission was the failure of the *Mir* contact, scheduled for nine days into the flight. The Johnson Space Center hams responsible for SAREX were unable to complete arrangements for a quick, last second *Mir* contact on the final day, even though they went as far as phoning their Moscow contacts.

Columbia completed its tenth spaceflight, and the Astro mission, on December 10, 1990, at 9:54:08 p.m. PST, when it landed on concrete runway 22 at Edwards AFB in California. When Astro flies again, backup payload specialist Ken Nordsieck will fly with either Ron or Sam. I asked Ron if he'd like to fly with SAREX again, and his reply was an enthusiastic "Sure!" 73

Philip Chien is an aerospace and technical consultant with over 350 published articles in the aerospace and computer industries. He has covered the space program from the Kennedy Space Center since 1983, and computers and telecommunications since 1984. He has been promising to get a ham ticket for the past two decades, and will take the tests "any day now." Honest. Look for a callsign before the next SAREX flight.

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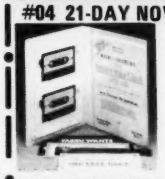

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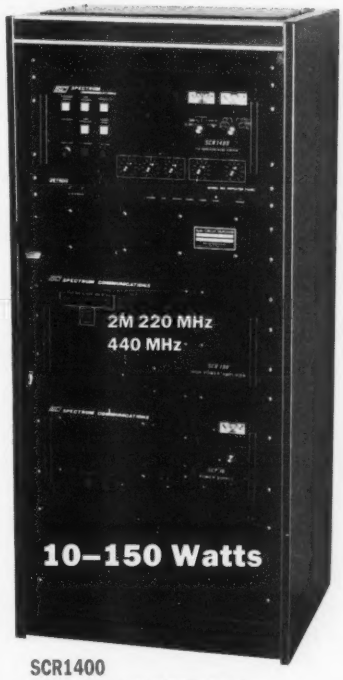

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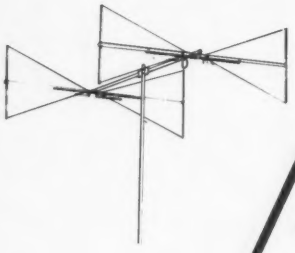

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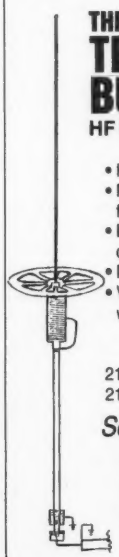

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ELTs and EPIRBs Revisited

Right now it's evening and I'm looking out the window of an L-1011 jumbo jet that has just taken off from the Dallas-Fort Worth airport. Reflections from street lights in the new subdivision below make the roads stand out like dotted lines. I wonder if anyone has put on a hidden transmitter hunt in this part of town yet.

Thinking of flying and foxhunting makes my mind wander back to a night in the summer of 1982 when I was among a group of hunters waiting for the last vehicle to find the T on a hillside in rural Yorba Linda, California. We idly noticed a Cessna four-seater above the hills to the east.

All of us then looked away except April WA6OPS, who saw it abruptly nose over and disappear behind a hill. A few minutes later we heard emergency vehicles on the freeway below. Still later, we learned that the plane had crashed near the freeway, killing all aboard.

That mishap occurred very close to a populated area, and nothing could have been done to save the victims. But aircraft, boating, and hiking accidents often have survivors who need to be located and rescued from dangerous situations before their injuries claim them. That's where skilled volunteers who know radio direction finding (RDF) enter the picture.

"Homing In" readers are interested in search and rescue (SAR), and they have strong opinions. I know, because they responded in record numbers to the October and November 1990 columns on the subject. In those issues, I explained impact-activated 121.5/243.0 MHz Emergency Locator Transmitters (ELTs) for aircraft, and their maritime counterparts, EPIRBs. I told about a new Personal Locator Beacon (PLB) service for hikers and campers, called PELTS, that was originated by KA7OSM and proposed officially, in a much different form, by the FCC. I asked you to let me know your thoughts.

Reader Reactions

J. C. Arenburg W4DZA, a major in the Civil Air Patrol (CAP) reminded me to mention that an injured person's chances of survival go down by 80 percent in the first 24 hours, so the rescuers' speed is vital. "Constant practice is important," he writes.

Henry Mosely KA1RRT of Grafton, Vermont, sent along a page from a catalog he received, advertising for $100 a "Human Emergency Locating Transmitter" that "can save your life." The ad goes on to say: "Transmits SOS via satellite to US Air Force Rescue Center. Rescue teams 'home in' on your signal. Field tested and government approved."

Government approved yes, but only for aircraft or boats in distress, not individuals. The ad fails to mention the $10,000 fine that can result from improper use. "Hunters and hikers will be (accidentally) turning them on in their tents," he worries. These ELT clones transmit continuously when activated, so the signal from a false alarm can cover up a legitimate distress signal.

On the other hand, many writers are concerned that there is an excellent satellite-tracked emergency beacon service for boaters and aviators, but nothing similar for wilderness users. Bruce Wright N8MWL is a frequent backpacker. He is working on a QRP ham rig for hiking, instead of buying an ELT clone. But he would prefer to be able to call for rescue on the frequency that is presently most likely to evoke a response: 121.5 MHz.

"It would not matter if it is illegal," Bruce wrote. "A jail cell would be a welcome alternative to most emergencies. This attitude is why so many ELTs are in use (by hikers)." N8MWL wants a separate satellite-tracked and aircraft-monitored PLB system for the general public that could get response like the 121.5 MHz system does, and adds, "There's no reason for aviators to have a corner on the lifesaving market."

Almost no one liked the FCC's PELTS proposal, which called for PLBs with nine ACSSB voice channels and one homing channel near 220 MHz. Typical responses: "If it had been approved, PELTS was going to be a total, absolute disaster!" and "I agree with you on PELTS. No voice!"

By far the most deeply-researched response came from Lou Dartanner N6ZKJ.

Lou sent a four-page typeset document titled "Personal Locator Beacons—A Status Report," which she prepared for her company. It gives a wealth of general information about PLBs, and summarizes the discussions at a full-day seminar on the subject put on by the International Committee on Search and Rescue (ICSAR).

Every paragraph is packed with useful information. There is no way I could cover in this limited column space the depth of thought and analysis that has gone into the ICSAR seminar and N6ZKJ's report.

What are other countries doing to implement PLB systems? Will inexpensive PLBs encourage hikers to take unnecessary risks because they can easily call for help? Should there be fines for persons who generate false alarms with PLBs?

Did you know that alerting and homing systems using call boxes and short-range transmitters are now being developed and tested for use within the confines of national parks and small wilderness areas? This report gives more details. What are the liability issues faced by responders to PLBs?

Could SAR organizations be sued for not rescuing someone in time? That's in the report, too.

The report also tells about global locating systems on the drawing boards from several companies, including Orbital Communications, American Mobile Satellite Corporation, Atlantic Research Corporation, Qualcomm, Geostar, Starsys, and Motorola. If you would like a copy of N6ZKJ's report, send an SASE to L-tronics, 5546 Cathedral Oaks Road, Santa Barbara, California 93111, and ask for the report by name.

Lou recognizes the potential for overload of the present 121.5 MHz SARSAT system, but would still like to see it used for wilderness PLBs, since SAR teams are already equipped for it. Equipping volunteer rescue teams for a new system on a different frequency would be costly, she says, and would slow the implementation of this badly needed service. If ELTs and PLBs transmitted intermittently instead of continuously, then false trips would not "jam" emergency transmissions.

Photo A. It's that one! Steve Kirkman KB6IMB (left) and Jim Frank KB6ONC of the Los Padres Search and Rescue Team have found another squawking ELT at the Santa Barbara airport with their L-Per RDF set. (Photo courtesy N6ZKJ and K6IA.)

Ask An Expert

Lou Dartanner knows a lot about hunting for ELTs; she has done it for almost 20 years. Lou and her partner Bruce Gordon N6OLT founded L-Tronics when ELTs became mandated for certain aircraft in 1972. The SAR community needed a complete, lightweight RDF unit that could be used in vehicles, on foot, and from aircraft.

Bruce designed the "Little L-Per," and Lou built the first 100 units. When they sold out immediately, Bruce and Lou knew they were headed for success.

Today the L-Per, with its two switched vertical antennas, is the "standard issue" RDF set for CAP and SAR groups all over the USA and the world.

The L-Per's self-contained four-channel crystal-controlled receiver was designed for popular SAR training and operational frequencies, such as 121.5, 121.6, and 243.0 MHz. But, with a change of crystal and a little tweaking, it will work on the amateur 2 meter and 1¼ meter bands. Despite its four-frequency limitation, many RDF competitors rely on L-Pers for on-foot sniffing duty during foxhunts.

Lou has not given up on her commitment to SAR. In fact, she is more active than ever, and says, "I still learn something every time I go out." Dedicated volunteers like N6ZKJ make the Los Padres Search and Rescue team (LPSAR) one of the most active and well-respected groups of its kind in the country. (See Photo A.)

LPSAR, an auxiliary of the Santa Barbara County Sheriff's Department, has a Memorandum of Understanding with the Santa Barbara Amateur Radio Emergency Service. ARES members become part of search teams to provide vital communications and RDF services. It was her desire to be able to use Amateur Radio for SAR efforts and to facilitate ELT alerting that led Lou to get her ham license.

Early Warning

According to N6ZKJ, a majority of ELT/EPIRB trips occur in the early afternoon, but SAR groups are often not activated for several hours while satellite fixes are performed, the FAA checks flight paths, and the callout request goes through the chain of command. When volunteers are alerted in the evening and nighttime hours, it's harder to organize the team because facilities are less accessible than they are during business hours.

To reduce the delay, L-Tronics developed an automatic alerting system for Santa Barbara County hams. A 121.5 MHz receiver is incorporated as part of the K6TZ repeater, overlooking Santa Barbara Harbor. When an ELT or EPIRB signal trips the receiver, the

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Third Term for the C-64

As we go Marching along, I find myself mired in a pile of letters! To wit:

Rick Arzadon WA8RXI of Taylor, Mississippi, says he reread the "RTTY Loop" column of November 1989 and became interested in the "ThirdTerm" terminal program originally offered by Jack Skubick K8JS for the C-64 computer system. According to Rick, Jack no longer has a C-64 system, and therefore no longer provides "ThirdTerm" for it. Rick is looking for a source of this program.

I don't have a Commodore system here, so I really can't help on this one. I would love to hear from some of you, though, who could provide this shareware program to fellow readers.

Rick also says that he has a receive-only packet program and interface obtained locally for VHF reception, and that he is looking for a multimode terminal unit. He asks that age-old question, "Of the three controllers, the AEA PK-232, Kantronics KAM, and MFJ-1278, which one has the best overall performance receiving and transmitting?"

The simple reason that I have never directly answered this question is that I do not have the data. While I have one of the three controllers here at WA3AJR, the only information I have on the others has been picked up from conversations with other hams, advertisements, and review articles. That I know of, no one has ever done a real head-to-head comparison of these three top-end machines, and in all likelihood, there may be no real point to doing so. I suspect, from what I've seen and heard, that differences in terms of signal acquisition and decoding are minimal. There may be bigger differences in features or operations, but that gets more into the line of personal preference than true ratings.

So, I guess the bottom line is to see if you can find someone with a unit you have in mind, go over to their shack, and play with it for a while. Like a car, some folks prefer Chrysler, some GM, and others Toyota. None of these are better or worse, just different.

This, That, and Something Else

Speaking of "different," I received a letter from S. Roy Luxemburg N5QQM currently residing in Singapore. In part, Roy says that [thanks to "RTTY Loop,"] "I purchased a Model 35 from Western Union in 1981. I had thought to use the former TWX service with WU, and . . . [also be able to] . . . connect it with ham radio. Talk about lamentable ignorance! I still have the machine, but it turned out to be *almost* a white elephant.

"In an attempt to follow my keen, if unfulfilled, interest, I continued to slowly accumulate information and equipment. Then came the wonderfully informative issue of *CQ Magazine* for November 1983. That did it. I bought a HAL CWR 6850 . . . and got a clue about SWLing with RTTY!

"But I wasn't there yet. My subscription to *73* ran out and I decided not to renew after several years. To make matters worse, I had allowed my license to lapse (sheer negligence in the light of the foregoing!) and recently re-acquired a license. Now I also have a Tono 15000E and two, count 'em, *two* AEA MBA-RCs for code conversion.

"I then built a Heath Ultramatic Keyboard to get from Morse to RTTY and ASCII. Along came AMTOR—great, but I think RTTY is still the best.

"Reading your column this morning was a costly enterprise, HI! I spied *73* in a magazine rack on Orchard Road, a great shopping area here in Singapore. The price of *73* was S$10.60, which is more than $6 in the States! That did it. I'm subscribing again, today.

"We are rich in vacuum tube equipment at N5QQM, having about 25 Collins and Hallicrafters receivers, two KWS-1s, SR-400A, four or five HT-32s, one HT-20, and an HT-1 (!), as well as a 32V2 and 32V3, CE200V, and on and on . . . .

"Do you ever write about the old gear? FSK generation for the old vacuum tube transmitters, possibly? How about stuff on the many special things you've done with the old stuff?"

Well, Roy, about the most impressive thing I've done with the "old stuff" is get rid of it at the wife's insistence. But seriously, I have covered the gamut here, from shift pot circuits to tuned tanks. I am always willing to re-examine an old topic, so just let me know what turns you, or your system, on.

Computers and RFI

Another note, this one from Dick Peters WA1PWF of Norfolk, Massachusetts, deals with the eternal question of RFI. Dick tells us that he is using a Tandy 100 laptop for RTTY, AMTOR, and packet, and he would like to go for a big PC clone, but wonders about RFI.

He is aware of the FCC classifications of computer equipment as Class A or Class B, and wonders how they relate to practical considerations in the ham shack. Dick has an old TRS-80 which is "horrendous" on the HF bands, and which makes him edgy to lay out "big bucks" for a more modern machine.

Well, Dick, in general the FCC guidelines are probably the best thing you've got going for you. Some time back we covered the specifics, and I'll go through it again if a bunch of you want me to, but the long and short of it is that the guidelines for FCC Class B are at least much better than Class A in reducing unwanted emissions. This means a lot if you are trying to pull the weak one out of the mud. Class B computers are the only ones certified for home use. So, if someone tries to sell you a Class A computer, or worse yet, an uncertified computer, just say no. Sorry, but that kind of tsoris *[trouble, distress, woe, or misery, according to* Webster's New World Dictionary—*eds]*, you don't need.

We'll cover more of this craziness next month, and try to respond to some of the things you have asked about. I especially appreciate the comments, questions, and suggestions regarding simple little devices and circuits of use to the RTTY-o-phile. Some of the best of them may well be gracing a future "RTTY Loop." In the meantime, keep them coming by mail, to the above address, or on Delphi (username MARCWA3AJR) or CompuServe (ppn 75036,2501). Graphics as PCX, TIF, or GIF files are welcome as well. 73

Homing In

Continued from page 59

repeater automatically pages LPSAR hams. At the same time, it dials into N6ZKJ's computer, reports the time and strength of the ELT signal, and sends a sample of its audio.

LPSAR has added three other remote ELT/EPIRB monitors, including one on the CAP repeater atop Santa Ynez peak. The Santa Ynez repeater has automatic paging, while the other two are tied to the computer via landline. The computer keeps careful records of all alarms, and facilitates comparison of the signals from the remote sites to pinpoint the signal source. Says N6ZKJ, "This SAR team takes each ELT signal seriously."

The next logical step would be remotely-operated 121.5 MHz direction finding equipment at the receiver sites, right? The Santa Barbara hams have already of thought of it, of course. But it's tricky. Sensitive RDF sets with switching antennas usually do not perform well next to high power transmitters at typical radio relay sites. Despite the technical problems, they are making progress, and I hope to be able to report success in a future "Homing In" column.

Pioneer Hams

The Santa Barbara remote alerting system has been so successful that it has become the prototype for a nationwide network, with L-Tronics as the prime contractor. Sixty-four ELT monitors are now in place at airports in 38 states, with more in the planning stages. Each unit dials a computer at the FCC in Washington and sends data when it hears an ELT or EPIRB. Who says we hams don't make technical innovations any more?

There is lots more to tell about the good work of LPSAR, but it will have to wait until another time. Meanwhile, hats off to Lou and others around the country who use their T-hunt talents for this important public service.

And thanks to everyone who wrote in about SAR RDF. Keep the cards and letters coming, and find out how you can help fill the SAR needs in your area.

As W4DZA put it: "There is nothing quite like the thrill of hearing someone say on the radio, 'The chopper/ground search team is on the way to base with a survivor,' and to know that you played a part in possibly saving a life." 73

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Never Say Die

Continued from page 4

glee over your latest choice of directors—most of whom you let run completely unopposed. Wow, talk about apathy!

Bigotry 1991

Yes, I know we're not supposed to talk about race, politics and religion over the air. Heck, people get holy hell just for writing about it. These are areas where few people are able to think and most just react . . . usually negatively. Hate.

We can cover it over if you prefer, but the fact is that I'm hearing more racial slurs over the air these days than I can ever remember in the past. I'm not talking about racial jokes, no matter how tasteless. Alas, we seem to have built up a sensitivity to even the slightest hint of a slur against a race or group. I wonder if Randy Newman's "Short People" would even get played on the radio these days?

Comedians are having a terrible time. They can't joke about blacks, Jews, Catholics, women, gays, cripples, lawyers, doctors, morons, drunks, drug addicts, Italians, Poles, Arabs, Mexicans . . . without being accused of being insensitive. Andrew Dice Clay is a natural result of this oversensitivity syndrome. This is why he is able to convulse audiences.

This is also why, I suspect, we're hearing so much insensitivity over the air. Oh, some of it is the Archie Bunker mentality sounding off, but much of it is just hams fed up with sensitivity and wanting to stir things up. Old-timers will remember W2OY, who made a career of angering anyone who's goat was on a short tether.

As a rich, conservative American WASP, I'm a ripe target for almost every group to hate. I'm white, so most blacks hate me automatically. Hispanics too. You can imagine how long I'd last in Baghdad today. Or Tehran. Even in Paris it's safer to wear a Canadian maple leaf. You don't get treated quite as lousily.

The poor hate me for being successful. They're not willing to put in the work I have, so they can only hate me for having worked so hard for so many years.

The Muslims hate me for coming from a Christian country . . . and never mind my own religion. Let's kill him, just to make sure.

The Chinese hate me for being an American, being white and being a capitalist. Think I'll just stay away from China for a while. Since as a country (with the exception of Bush) we're mad at China for killing all those students, it's safe to make fun of the Chinese. And the Iranians. No one is going to accuse us of insensitivity if we dump on Iranians, right? Or Iraquis. Seems like rather fickle sensitivity to me, but then perhaps I'm oversensitive to sensitivity.

Was it unfair that the Bush team beat Dukakis over the head with Willie Horton? Was that insensitive? Or was that a fair attack on a governor who let his liberal political beliefs blind him to the danger to society he was turning loose?

When I was young I never had any reason to fear going anywhere in New York City. Blacks and Hispanics were just other people. Now, together with every other white person in New York, when I see a group of blacks coming along the street or in a subway car, I'm afraid. I know I'm at their mercy and that no one is going to take a chance with their lives to help me. The blacks know they can do anything they want. Is it bigotry that is involved, or the knowledge that the overwhelming percentage of crime in New York is black instigated? I believe in those odds and stay away from New York as much as possible to keep them low. One of the best moves of my life was to New Hampshire almost 30 years ago . . . after having lived in New York for 30 years on and off.

Amateur radio in America is a white hobby. We may have 13% blacks by population, but I'd put the black ham population at well under 1%. Should we feel guilty about this and make a big effort to recruit black hams? Should we start pushing for more Hispanic hams? More women? More gay hams? Ha, gotcha that time . . . I know you don't want more gays. I made a lot of enemies when I wrote an editorial explaining that sexual preference seems to be programmed in genetically, so give 'em a break. Whew, did I get a bunch of hate mail on that one!

I explained last month that men and women have a great deal of difficulty talking . . . not just over the air, but to each other anywhere. The two sexes are so basically different in goals that communication between them, even in marriage, is a major problem.

With men it's macho on the line all the time. With women it's a need to be loved. Men basically don't need to be loved, they want to conquer. I know I should write the whole book on this instead of presenting it in shorthand in order to head off hairsplitting emotional arguments, but that's what we're up against . . . and one of the major reasons why we have so few women on our bands.

Men constantly try to one-up each other in contests, pile-ups, certificate hunting, broadcasting bulletins . . . and in being outrageous on the air. The worse we are on the air, the more we are trying to cover up our own inferiority feelings. And, feeling inferior, obviously we'll put down anyone who is different . . . by race, accent, color, sex, size, religion, politics. Where is W2OY when we need him . . . to help blast those moronic, short, fat, black lesbians off 14.313?

Perhaps the FCC will recognize the terrible social travesty here and insist on affirmative action, stopping any more whites from getting ham tickets until we're up to 13% black. It would be insensitive to do anything else, right? How do we have the right to all these public radio frequencies when we have remained firmly unintegrated?

Will blacks demand a lowering of the technical barriers on the basis that they are unfair and have been keeping them out? This is what has been happening in other similar cases. If the blacks can't make it, we lower the barrier . . . but just for blacks.

Then we'll certainly hear from the women, demanding a further halt on men being licensed until we're up to 50% women. And what can we reply when they charge that a small, exclusive old white man's private club has been unfairly given use of hundreds of billions of dollars of government property?

What percentage of Hispanics will affirmative action force us to recruit? American Indians? Koreans? Cambodians? That's crazy, they wouldn't dare mess with our small, private men's club—would they?

Mad yet? Well, I'll try harder next month. H.L. Mencken wrote, "A sense of humor always withers in the presence of the messianic delusion, like justice and truth in front of patriotic passion."

And The Winner Is . . .

We had two big winners recently which were financed by the bountiful ARRL coffers. These seemingly bottomless money pits, enthusiastically funded by the ham industry and a docile membership, made big winners out of the ARRL's law firm, even though it went down to a totally predictable defeat in the really dumb effort to fight the FCC in court over their 220 MHz decision.

The FCC, not liking to be sued, particularly where such a big cover-up of political influence was involved, has thus been even further estranged as an ally to amateur radio. Talk about biting the hand that feeds us! It's like kicking the judge on your case in the crotch out in the parking lot just before you go on trial.

The other big winners of the month were the ARRL directors, most of whom ran unopposed (again), and are thus back at the old Newington feeding trough, gleefully dividing up their share of your (and industry) yearly donations.

It's no wonder the directors have such a low opinion of the membership and talk of them as mindless sheep they can manipulate in any way they want. It's a terrible thing to consider, but perhaps they're absolutely right! The 1990 election, if we can dignify the travesty with that name, would seem proof positive that the membership could care less what happens to amateur radio.

Yes, I see those furtive looks and sense your surliness. I'm saying, "Bad dog," and you're feeling guilty and a bit defensive over the mess you've made. The guiltiest of all are the Rocky Mountain members who allowed Marshall Quiat to run completely unopposed. I couldn't believe it! I wouldn't have been any more surprised if they'd run good old Charles Keating for the job! Or Saddam Hussein. Obviously there is no sense of shame in Denver . . . maybe something to do with Bronco guilt, I don't know.

Oh sure, go ahead and get mad at me. Sure, shoot the messenger, but whatever you do, don't read the message. Hey, when things are going good, I'm a great cheering section. But when they're bad, I'm not going to be part of the cover-up. I tell it as I see it and I have a discouraging record of being right. If you bet with me you'll usually win. If you bet against, you're looking to lose. And if you think that's old Uncle Wayne's ego again, start reading my old editorials and see how often I've been wrong in my predictions.

Now, when half of the directors come up for reelection this year, will half the membership go blind and dumb again? Or are you going to start looking around for someone to run against the incumbents? We need some new scoundrels in there at the ARRL trough.

Oh yes, there was a rumor going around at Christmas that President Price would be replaced at the January director's meeting. It was a nice Christmas present, even if it turns out to be a bum steer. Maybe they'll elect Quiat. Why not expect the worst and then be pleasantly surprised if the disaster comes short of it?

Prodigy

My wife (Sherry) is up to here in Macintoshes. Fortunately we live in an area of the country where there are more computer experts per square mile than Silicon Valley, so she's had plenty of help getting her Macs going.

She uses 'em mostly for desktop publishing to support the one hundred how-to-dance videos she's produced (so far). But she also gets trapped by computer games. Then came Prodigy, with its local phone number. Now her Mac is connected to the BBS for hours a day.

As much fun as RTTY was while I was involved, I sensed that I had to cut the cord. It just gobbled up too much time. I'd get typing away to friends on RTTY and the next thing I'd know it would be 4 a.m. That wasn't the way I wanted to spend my life.

When BBSs came along I tried one and found rhyself in the same quicksand. Whoa, boy! Yeah, it's fun to sit and chat. But it doesn't do much toward helping me to accomplish my goals. Of course, if you don't have any goals other than marking time until you die, a BBS can be a great way to get rid of large gobs of time.

Prodigy is the BBS the users love to hate. It's slow, expensive, your stuff is censored by dictatorial morons, you can only send short messages, and it sure isn't user-friendly. Fax communications beats it all hollow for my money.

On the positive side, I found some old friends there. Alas, I found the need to keep messages short. There's no way to discuss ideas intelligently in a few paragraphs. Using Prodigy is more like conducting a chess game by mail.

You can leave messages for me on Prodigy at JJMK68B . . . or fax (603) 525–4423 . . . or by mail in Hancock NH 03449. I'll get 'em all. Please don't (do not) phone. I hate the telephone. Also, I travel, so don't expect quick answers. For instance, in January I was in town the 8th, 15th, 16th, 24th, and 25th. With 16 current publications (all requiring lengthy editorials), two new ones

starting that month, and four more in the works, I had more to do than get back to "How are you?" BBS messages.

How am I? Don't ask. I already covered that a few months back in detail. I'm fine, thank you. Having been dieting lately, I'm even less tolerant of fools and their blather about no-code than usual. Not one single new argument, pro or con, has surfaced in the 32 years I've been championing a no-code license. Phooey.

Getting back to BBSs, I prefer to spend my time reading (for my education), writing (to educate others) and getting things done toward my goals in the music, educational, publishing and ham fields. All work? Nah. I do get out skiing, diving, watch some TV, catch a few movies, see some plays, and go to some concerts. Not bad for living in the mountains of New Hampshire, eh?

Old-timers have followed me from the *73* start in October 1960 in a little two-room office over a Brooklyn grocery store. Even older-timers remind me of my first ham magazine back in 1951, which I started from Cleveland, Ohio, while working as a TV director.

I've been giving advice for most of these 40 years. A few people have taken it and done well . . . getting into the hundreds of millions. Some have ignored it and lost . . . some have even lost billions ignoring my advice. I don't think anyone has ever lost by paying attention to my predictions.

Negative Vibes

Does your faith in amateur radio have the vitality to face unpleasant truths about your hobby? Or do you prefer the usual whitewash, everything-is-actually-peachy approach in your reading?

I get a few letters grumbling about my gloom and doom observations. It seems to escape these negative-oriented folk (of which we have a seemingly endless supply in amateur radio) that my glooms are always accompanied by creative, constructive solutions to our problems. I believe in facing our problems and solving them. That's the only way they're going to go away. I'm solution-oriented. How about you?

On a recent skiing trip to northern Vermont I finally had enough time to myself to get some work done. First, I planned a complete reorganization of the reporting system for the many projects I've got going.

Then I caught up with a cubit stack of magazines I'd brought along. I like to keep up with technology. I never know when I'll run across something which I can use. So I read *Scientific American*, *Omni*, *Discover*, *Fortune*, *Success*, *Technology Review*, *Kappan*, *Inc.*, etc., marking ideas of value as I go.

The magazines read, I turned to a stack of books. I always take along more than I can possibly read. The last time I went on a reading binge like this was a year ago when I was on a scuba diving cruise with Chuck KO1I. We dove all day and I read the rest of the time. This time I skied most of the day and read the rest of the time.

Now there you go, being negative again, grousing about old Wayne wandering off about this and that. Yes, I do, it's one of my few charms. But wait'll you find out what I lucked into, bookwise! One of 'em explained a lot to me . . . and you should find it interesting, too.

The book was "How to Work the Competition into the Ground and Have Fun Doing It," by John Molloy, the chap who wrote "Dress for Success" and "Live for Success," both of which I enjoyed. This little old $10 paperback was great! Full of ideas.

But the part that was of the most interest to me had to do with creativity. I'm always interested in this subject and how it can be taught. Well, John does a lot of consulting and one of his projects was to try and find out how creative people differ from others. And why.

Being an almost pathologically creative person . . . it's more of a curse than a gift . . . I wanted to find out how this happened to me. John interviewed a bunch of outstandingly creative people, trying to find out what they had in common. His findings were surprising . . . and discouraging.

I found them discouraging because I was hoping creativity might be more teachable. Entrepreneurs need creativity in heaps to surmount the constant flow of serious problems they face. America needs creativity if it's going to regain its lost high tech industries. We're famous for inventing new technologies and then watching the Japanese develop the practical applications, running creative circles around us.

We invented tape recording, and they smothered us in innovative tape recorders. We invented digital watches, and they buried us in innovative watches. We're desperately hurting for creativity in our industrial research labs.

Look at how we're hurting in amateur radio for the lack of creativity. We should be years ahead of where we are in spread spectrum development, in high speed digital communications . . . including not only words, but graphics and music. We've deplorably let our hobby and our country down. We're far busier fighting over that antique communications curiosity, the Morse code, than in trying to move ahead. Morse is fun, but it's about as relevant to communications today as the cat's whisker and a chunk of galena. It's for people who are holding desperately onto the past because they have no vision of the future.

I couldn't help but take another swipe at the old-timers who have dedicated their lives to trying to bury amateur radio . . . along with themselves.

Now, back to what John found out about creativity. We're talking creativity in business and engineering, not artists and poets. First, he found that creative people tended to be highly intelligent. Second, they were hard and effective workers. John says, "In fact many work all the time. They never turn off. They take their work with them wherever they go." Hmmm, that sounds familiar! Hey, that's me, with my laptop computer in the back seat of my van.

"They create by bringing order to seeming disorder. They're always thinking, rethinking, reviewing, and reordering." It's the old 5% inspiration and 95% perspiration formula espoused by Edison.

The third characteristic of creative people is a positive attitude. Oh, they are as aware of the problems as anyone, but they're optimistic about them. When I get a letter from a reader saying he doesn't always agree with my editorials, I know he's not a creative person. A creative person reads my editorials and comes up with even better solutions to problems. He just doesn't think in negative terms.

When I get a really negative letter I feel sorry for the writer. I know he's that way about everything and with everyone. He isn't selecting me to dump on, I'm just one more. What a horrible person to have to work or live with!

Molloy found that creative people were loners as children. They tend to march to their own drum and to heck with conformity. "Pragmatic nonconformists," Molloy calls 'em. Most still dress the way they want and don't care what others think. As kids they didn't have many friends . . . didn't need 'em.

I tried smoking and didn't like it, so I never smoked. I tried drinking while I was in the Navy. When I noticed that alcohol made me stupid, I stopped. I tried pot and LSD a couple times. Nope, not for me. I tested those drugs and decided conformity wasn't worth it to me.

Creative people love solving problems. Maybe that's why I can't pass up a crossword puzzle or a cryptogram. And I truly enjoy helping people solve problems. That's why I read over a hundred magazines a month and books by the dozen . . . I get ideas from them which eventually click into place to help solve a problem. I enjoy mentoring college students.

Well, hooray for me. Yeah, I suppose. But understanding that negativeness prevents people from being creative is worth understanding . . . particularly if you are an employer . . . or if you're looking for breakthroughs in amateur radio. Employers need creative problem solvers, not negative thinkers. And they get hard workers as a bonus.

With the future obviously going electronic, we need all of the creative people we can find. And we need to attract 'em to amateur radio, where they'll be able to help both us and our country. If we let the Morse coders keep us in the 1930s, we're signing a death warrant for the hobby . . . and we could be helping to consign our country to second place . . . or even third, behind Europe.

Yes, I know all about the new no-code Tech thing. I also hear the old-timers' necks creaking as they warn of dire consequences. Meanwhile, the ham industry—in a burst of euphoria—is again expecting the money tree to start growing. Like when we got Novice Enhancement. Remember that beaut?

Being pragmatic, I warned that all we'd done is remove a small roadblock. We still hadn't put up any road signs. The no-code deal is another block gone. We still have to go out and advertise or the kids aren't going to even know our road exists. Has the industry learned yet? Are you kidding?

I'll be reading every ham club newsletter I can get to see if one ham club anywhere has come up with a positive program to promote the hobby to kids and get the parade started.

If I Asked You . . .

Suppose we're having a contact and I asked you to tell me about a time when you really had a lot of fun with amateur radio. What would you tell me? A question like that could keep me going for days. How about you? I don't suppose there's any chance you'd take a few minutes and write, since I haven't run into you on the air recently?

Ham radio has provided me with a couple lifetimes of fun. That's one of the main reasons I got snookered into publishing *73*. It's got something to do with wanting to share the things I've enjoyed with as many people as possible. In my *CD Review* magazine I'm having fun introducing the readers to music they might otherwise have missed.

When I got out of the Navy after World Misunderstanding II, it didn't take me long to build an all-band (813 s) kilowatt rig. Then I lucked into a beaut of a 75m kilowatt rig (203Zs). I had two complete kW stations, one with an SX-28 Hallicrafters receiver, the other with a National 100A.

I had my ham shack set up in the basement of my fraternity house at college, with antennas all over the place. The fun was to get into a round table on 75m and then go down to 20m and make a DX contact and rebroadcast his signal on 75m to the round table. In this way we were able to work African, European and Asian DX stations into our round table. The net could hear the DX chap through my 75m rig and he could hear the net through my 20m rig. That was a ball!

Yes, of course I got a pink ticket from an FCC monitoring station. I just sent 'em a copy of the letter I'd gotten from the FCC in Washington saying this kind of operation was legal. Didn't hear any more.

So tell me about some of the exciting things you've done. If you get me excited too, I might share your story with the *73* readers . . . or in a publication to help get Novices more involved with the hobby. Remember, when you're a silent key, about all that will live on after you is what you get published.

And it's really fun when your friends read your stories and feel they know someone famous. Or when someone you contact on the air has read your stories and recognizes your call.

I can handle anything I can read, from old notebook paper to a computer printout, but of course it's easiest for me if you include a floppy disk. 73

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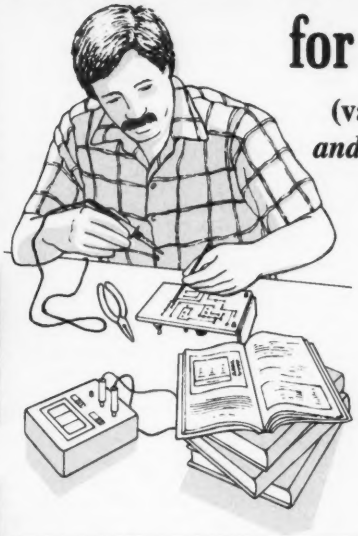

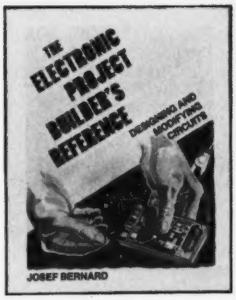

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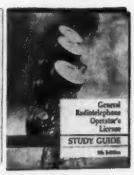

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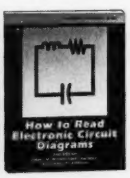

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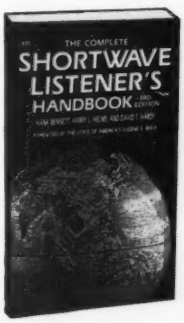

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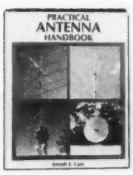

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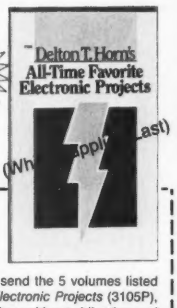

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STS-35: Mission Accomplished!

It's been over seven years since the first ham-in-space activity by Owen Garriott W5LFL from the space shuttle *Columbia*. Since then, others have gone into orbit with amateur radio gear. Callsigns like W0ORE, DP0SL and U2MIR have been heard from orbit. Now WA4SIR joins the ranks of the ham-in-space fraternity. His efforts from STS-35 were quite popular and very successful.

Columbia blasted skyward on December 2, 1990, in a spectacular nighttime launch carrying the Astro-1 telescope mission and Ron Parise WA4SIR with his ham radio gear.

The $150 million Astro STS-35 mission carried four advanced imaging systems. The broadband X-ray telescope, designed to be pointed by ground controllers, worked well. It succeeded in sensing much cosmic phenomena not visible from the Earth's surface due to the absorbing characteristics of the atmosphere.

The other three telescopes, aimed at their targets by computers in the shuttle, were designed to receive ultraviolet radiation. On the first day of the mission, one of the telescope-steering computers failed. Four days later, the second one went down. The systems were located in the shuttle rear-deck area. Ground crews and the flight team found the situation difficult, but not insurmountable, as controllers on Earth radioed target coordinates verbally to the astronauts, who used joysticks and TV cameras to aim the telescopes manually.

SAREX-II Successful

The Shuttle Amateur Radio EXperiment went much smoother than the telescope operations, but not without a few problems. On the positive side, 238 stations around the world managed to make complete two-way packet contacts with the WA4SIR ROBOT terminal node controller (TNC). Signals from the shuttle could be heard on 145.55 MHz FM. The corresponding uplink was 144.95 MHz. Note Table 1 for a comprehensive list of those logged as complete contacts.

A few stations even had two-way voice contacts with the shuttle. Several hundred more packet stations were heard by the SAREX-II system and received unique QSO serial numbers. However, they weren't able to complete a verified two-way exchange. Thousands of stations attempted to contact Ron without success, but it was educational and even entertaining just listening to the voice activity or watching the packets flash past as *Columbia* flew overhead. Table 2 is a sample of a SAREX-II bulletin sent on the second day of the mission, plus some other bits and pieces of packets received as the shuttle sped around the world.

Not all of the shuttle activity used the published 145.55 MHz downlink frequency. Conversations could be heard on nearby frequencies during many evening passes when the shuttle was within range of the Johnson Space Center in Houston, Texas, or the Goddard Space Center in Greenbelt, Maryland. Several phone patches were made for the astronauts with their families.

Although many hams were probably listening in, interference was rare and the conversations, at least from the shuttle side, could be monitored on small home systems or even HTs.

If you are on the gold-star QSL list in Table 1, or if you made it to the silver-star QRZ list (published by AMSAT), send your QSL to the ARRL, 225 Main Street, Newington CT 06111, Attention: Education Activities Department. A silver-star contact means that the robot heard your call but could not complete a two-way acknowledgment. QSLs are also available for SWL reports. Those few stations that had the pleasure of a two-way voice QSO will be eligible for the top-grade QSL reply.

An important part of Ron's activity from orbit involved schools around the U.S. Although the shuttle was not in view over the U.S. during school hours, methods were devised to connect Ron to a phone network via hams in areas of the world that had direct 2 meter access to the shuttle. Stations in Australia, including VK2AS, VK5AGR, and VK6IU, provided access during passes over their coverage areas while PY2BJO did the same from his location in Brazil.

Questions were uplinked to Ron via this system. Ron would answer the questions, many times adding commentary about the view from above, and giving updates on the Astro-1 experiments. While only a few schools were involved with direct communications with the shuttle, many others were online, listening. AMSAT and ARRL representatives were pleased with the results, considering the complexity of the arrangement.

Lessons Learned

There were many comments from the Monday-morning-quarterback point of view about the STS-35 SAREX-II operation. The ham-in-space activity was extremely successful. Not all hams made contact with the shuttle, but everyone who tried, should at least have heard Ron or the robot. Much of the difficulty in working the shuttle was caused by vehicle attitude, operator schedule, interference, and system limitations.

During the flight of STS-35, the shuttle had to align itself for telescope observations. Since the 2 meter antenna was located in either the pilot's or commander's window, much of the time it was aimed away from the earth, or, due to its directivity, it was aimed at only a portion of its potential coverage area. Because of the vehicle's orientation, not even an antenna in the cargo bay would have cured the problem on this flight, but it could help considerably on future missions.

Because of phone patches and private conversations, the packet system was not active on many passes over the U.S. If a second radio operating on 70cm could be employed for private voice activity, the packet system could be operated full-time on 2 meters. But the amateur radio experiment isn't a paying customer, and it's difficult to justify the inclusion of more ham equipment just to simplify packet connects to an orbiting robot system.

Congestion QRM

For hams in remote locations around the world, it was relatively easy to make a complete packet contact with the shuttle. In the U.S., the situation was quite different. With as many as a few thousand stations all sending packets on the primary uplink frequency of 144.95 MHz, it is likely the SAREX receiver was in a state of constant overload. The 60 stations in the continental U.S. that actually completed a full two-way contact with the robot were either running a lot of power at just the right time, or were incredibly lucky, or both. Also, many uninformed hams could be heard calling before the shuttle was above the horizon, after it was long gone or even on the wrong frequency.

Fortunately, the shuttle activity on 144.95 MHz caused little disruption of the DX packet cluster using that frequency for terrestrial DX information forwarding. If the shuttle activity had occurred during a DX contest weekend, there could have been significant disruption of packet clusters.

Since Owen Garriott's flight, congestion on 2 meters has increased. Ham-in-space SAREX operation has been infrequent and of short duration, but it will require more coordination when ham activity from a U.S. space station becomes a reality.

The robot could only support nine simultaneous connects in progress at any time. During a typical successful robot QSO, an Earthbound station sent a connect request skyward. The robot received it and sent an acknowledgment with QSO serial number establishing the complete connect. The Earth station then sent an ACK back to the robot which, upon receipt, logged the Earth station's call in the QSL list and initiated a disconnect packet.

Unfortunately, due to heavy crowding on the uplink, many stations could not get their ACK back to the shuttle after the connection had been established. The robot continued to hold their callsigns until the connection timed out, thus making it impossible for others, beyond the nine connected stations, to get in. Only 13 percent of those stations who managed to initiate contact with the robot completed the two-way exchange.

Table 1. Two-Way Packet Contacts with WA4SIR

QSO ####	CALL	QSO ####	CALL	QSO ####	CALL	QSO ####	CALL
1	WP4XQ	377	KH6GPI	811	KH6GMP	1211	VK6ABY
5	VK5ZAH	412	XF3RC	833	WA0D	1213	VK6CC
6	VK3DBO	429	W1YRM	846	ZS6TVB	1214	VK6PH
7	VK5AGR	430	N3EMA	848	ZR6AGA	1218	VK5QX
9	VK3ZBB	445	N5BCA	849	ZS6SM	1219	VK5AVQ
11	VK2ZW	448	N5ITU	867	WW7B	1220	VK3YJM
35	W2DTC	463	YV1CP	881	XE2M	1229	VK4ZGF
40	NZ3F	467	ZS1CA	883	KA5CDJ	1246	N6DGK
48	VK6MJ	469	ZS4BU	885	XF3PP	1251	WB5NLY
49	VK6YJS	481	KH2A	891	XF3RA	1256	XE3RY
52	VK5ZK	484	JR1AHQ	892	XE3YE	1260	KP4EKG
54	VK4ZF	497	ZS6BTD	893	XF3AFU	1262	WP4G
55	ZS6IT	499	ZS6AQF	897	XE3XE	1280	NH6UY
59	AH6IX	507	JR3FRF	906	ZR4AAD	1282	WB6W
61	NH6OU	522	OA4AGM	915	KJ9S	1288	KI6QE
65	KH6H	530	JA9TQK	922	JR5EBL	1293	NW7N
67	WB6LLO	534	JH1OMA	924	JR1EDE	1308	N4PLY
68	N6JLS	546	EA8BRV	925	JH2NIT	1311	WD4SBV
69	N6KN	549	VK6ZZ	928	HC8VB	1312	K9ES
70	KJ6AW	550	VK6DM	929	HC5K	1314	K4OSM
71	N6WHO	552	VK6VX	930	PT2WWV	1320	KP4PX
72	NK6K	555	VK5ZTY	932	PT2AR	1324	YV5FSF
94	KA5SIG	559	VK3EEE	936	PY2EML	1327	YV5FSH
112	ZS6BBY	579	WY0H	937	PT2SC	1328	ZS1KT
117	N6ZAY	580	WH6AMX	951	JA3XCZ	1331	ZS6AWK
160	ZS6HS	613	N8DEU	961	JA3ZDJ	1365	PT2TD
174	WA6LIE	616	XF3R	962	JA6FTL	1367	PY6ASV
177	KE7NR	620	XF3RD	963	JK3RLO	1368	PT2ON
178	N6RVC	630	9Y4DG	986	4X4LF	1376	ZS6BNT
180	WA5PIE	635	ZS5NZ	988	KE0SC	1383	Z21GH
185	XE3EB	639	AH6IO	993	VK1AU	1393	JA1ESP
191	ZS6AKV	648	WA6YFD	1003	NP4BM	1395	JN1BWP
194	ZS6BMN	651	K6OYY	1011	ZS6AJS	1402	ZS1JY
195	3DA0AY	658	KA6UCD	1052	KB4QDE	1412	JH0AYB
199	VS6VU	666	KC5FP	1060	YV4ABC	1441	PU2NPQ
201	JH7CKF	667	N5QWC	1072	ZS5J	1442	ZY5AAT
204	JH3EXG	675	XF3OZ	1076	KA6NEI	1446	PY2NPP
209	OA4CK	676	XE1MMD	1083	NH6HF	1457	N6ZND
213	JH3FDA	679	XE1LM	1105	XE1PM	1466	WA2KDL
216	JP3QJJ	709	OA4HV	1116	HK4BHA	1472	N6MEL
218	JA1YZM	711	PY2GN	1122	ZS6BZE	1482	AA5GA
220	JA1ANG	712	PY2MSG	1125	ZS6XL	1486	W5IU
226	LU8DYF	713	PY2EXD	1136	JJ2RYW	1489	W5OJ
231	ZS6CA	718	ZS6AQC	1138	KJ9U	1511	KP4YD
247	VK3DTO	725	FR4FM	1143	XE1IX	1524	ZS6BSE
258	N6UEA	726	JR4BRS	1145	XE1RK	1550	JH2GEC
268	W7US	729	JH1LVN	1146	XE1LCE	1563	LU9DO
273	N5LCO	741	JA4BLC	1151	HC5AH	1570	FO5LQ
295	VK2RX	743	JA2BGX	1160	Z21FB	1599	KP4ECL
296	VK2BXQ	748	JJ1WTK	1169	JJ6AGL	1616	KA5OTB
305	VK6LI	750	JR1RBR	1171	JJ6AGM	1622	KG5ND
310	VK6YBP	760	JA2UGV	1175	JJ6AGN	1639	HK5BVD
314	VK5AKK	762	JP3QJK	1177	JJ6AGK	1657	ZS1SAT
316	VK4AGL	763	JN1GKZ	1184	AH6GR	1658	ZR1L
347	W5BKK	774	WD6DRI	1190	JA3YEO	1662	ZR5TT
364	WP4CNU	782	WQ0P	1192	JM3WYI	1668	KE2FB
365	8P6SM	791	KG3N	1193	JR8XPV	1678	VU2LBW
371	KG6DX	796	K4GMP	1206	LU1EXC	1701	JR3YEO
372	KH2D	801	KP4BJD	1208	VK6BMD		
379	WA6EMV	808	9Y4NC	1210	VK6YBQ		

Table 2. Sample of Packets Received from SAREX-II, STS-35

WA4SIR>QST:The SAREX Robot is a SPLIT FREQUENCY operation and is NOT receiving on this frequency. WA4SIR is listening for connect requests on one of the following frequencies: 144.95 (primary),144.91, or 144.97 MHz.
We are now in our first day of operations
WA4SIR>QST:with most things going well.
The Instrument Pointing System has delayed experiment operations at this point but we are working on it. Have fun working the robot and stay tuned for more information!
73's Ron, WA4SIRWA4SIR>NK6K:#17-is your SAREX QSO number.
Thanks for the connect from the Space Shuttle Columbia.
....
WA4SIR>N5LCO:#273-is your SAREX QSO number.
Thanks for the connect from the Space Shuttle Columbia.
....
WA4SIR>QRZ:#1202-KE7NR WA6AZP N6UEA N6NJI N6DGK WA0QII N6PSU N6RW N6WJP WB6LLO VK4AOR VK4BKW VK4ZGF VK2AAB VK2KJU VK4BCK VK2AS VK2PA VK2DFY VK3FRS VK2BXQ VK5QR VK5ZFM WA4SIR VK1ZZT VK3YJM VK5AVQ VK5QX VK5PO VK6DM VK6PH VK6CC VK6UU VK6ABY VK6YBQ WA4SIR>SAREX:Connect to WA4SIR for a SAREX Robot QSO with the Space Shuttle Columbia.
WA4SIR>N5ITU:#1300-is your SAREX QSO number.
Thanks for the connect from the Space Shuttle Columbia.
WA4SIR>QSL:NW7N/1293 KI6QE/1288 WB6W/1282 NH6UY/1280 KP4EKG/1260WP4G/1262 XE3RY/1256 WB5NLY/1251 N6DGK/1246 VK4ZGF/1229 VK3YJM/1220 VK5AVQ/1219 VK5QX/1218 VK6CC/1213 VK6PH/1214

What's Next?

The Soviet space station *MIR* has been active on 145.55 MHz FM simplex for quite some time. Musa U2MIR (UV3AM at home in Moscow) has been heard many times between 1200 and 1300 UTC. Mission Commander Victor U9MIR may also be on the air as time permits.

QSLs for current *MIR* contacts should be sent to: UA6HZ, Valery Agabekov, Box 1, 375600 Yessentuki, USSR.

Packet operation may begin this spring when the equipment can be sent up on a Soviet *Progress* launcher. The packet radio experiment acronym is AREMIR, for Austrian Amateur Radio Experiment on MIR, and consists of a TNC-2 and 2 meter HT built into a "black box" with connectors for the antenna and a laptop computer. Launch is anticipated in mid-March after some slips due to delays in final AREMIR checkout.

For the first few months AREMIR will operate in the beacon mode. Later, a laptop will be sent to *MIR* so the cosmonauts can enter messages. There is currently some concern about whether the laptop will survive environmental testing. It may not arrive at *MIR* until September or October, when the Austrian cosmonaut is scheduled to go to the space station.

STS-37 is currently scheduled to take off in early April. ALL of the astronauts are licensed hams! They include: Ken Cameron KB5AWP, Jay Apt N5QWL, Linda Godwin N5RAX, Steve Nagel N5RAW, and Jerry Ross (waiting for a new callsign).

The system they will take to orbit is comprised of a 2 meter HT, a spare battery, an interface module, a SAREX headset assembly, an equipment assembly cabinet, a TV camera with monitor, a laptop computer, and the window-mounted antenna. The equipment cabinet houses power supplies, a slow-scan TV unit, a fast-scan TV unit, a packet TNC, and the right connectors for hooking everything up.

While voice operation requires operator attendance, the other modes can be run either with or without someone at the controls. This promises to be an exciting mission. Check the AMSAT nets and bulletins for updates. 73

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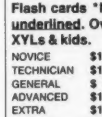

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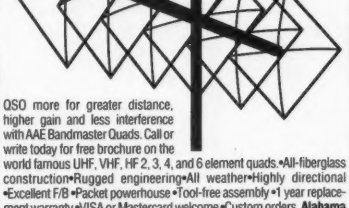

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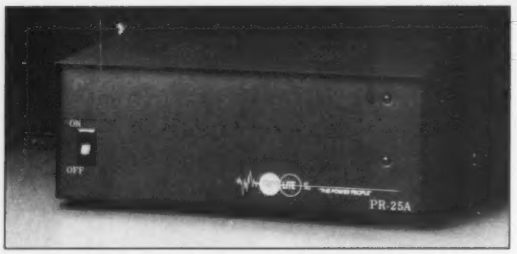

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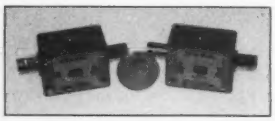

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This new 5th edition of *Great Radio Reads* is available for $1 from *Tiare Publications, P.O. Box 493, Lake Geneva WI 53147; (414) 248–4845.* It is also enclosed free with all orders. Or circle Reader Service No. 208.

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Spectrum International is now importing and distributing a complete weather satellite receiving system, including a PC controller, from Time Step Electronics of Great Britain. Instead of using a downconverter from 1691 to 137 MHz, then feeding the signal into a 137 MHz receiver, the new 1691 MHz design uses a dedicated 1691 MHz receiver. The companion low noise GaAsFET preamplifier has increased gain and better filtering than earlier models. The new system also has a companion decoder board (IBM-PC compatible, short-slot "half-card") and software.

The 1691 MHz preamplifier is $175, the receiver is $450, and the decoder board with software is $300. For more information, contact *Spectrum International, P.O. Box 1084, Concord MA 01742; (508) 263–2145.* Or circle Reader Service No. 202.

ELECTRON PROCESSING

Electron Processing is now offering a pair of high-quality keying devices. The Green Lake paddle and key are individually handcrafted by a master machinist and designed to withstand rigors and abuse that would destroy many other paddles. They are made of solid brass on a polished brass base (bakelite on the straight key), and they come with either hand-rubbed wood handles or polished aluminum handles. The Green Lake products are priced at $90 for the keyer paddle with wood handles, $100 with aluminum; $70 for the straight key with wood handle, $75 with aluminum. The S & H charge is $5. Electron Processing is also offering a new shortwave wire antenna, the Multiwire-4. For more information contact *Electron Processing, Inc., P.O. Box 68, Cedar MI 49621; (616) 228–7020.* Or circle Reader Service No. 204.

AZIMUTH COMMUNICATIONS

The new WeatherStar Master Weather Station ALT6 will help you monitor weather conditions with functions that give you barometric pressure (in. or mm), altitude, wind speed (MPH/KPH), wind gust record, wind direction (2 & 10 degree increments), daily and yearly rain (0.1" increments), an optional self-emptying rain gauge, inside temperature (with alarm), outside temperature (with alarm and min/max temperature record), wind chill factor, time of day (12/24 hour with alarm), and programmable scanning of functions. The ALT6 lets you set an alarm to warn of excessive wind gusts around your antennas and QTH.

The WeatherStar Master ALT6 is priced at $300, plus $7.50 for shipping. The optional self-emptying rain gauge (RG3) is $50. Contact *Azimuth Communications Corp., 3612 Alta Vista Ave., Santa Rosa CA 95409; (707) 577–8007, FAX (707) 573–1482.* Or circle Reader Service No. 206.

DELTA RESEARCH

DELTACOMM Version 1.04 from Delta Research is a state-of-the-art communication manager for the ICOM IC-R7000. Unlike similar products on the market that merely control the receiver, DELTACOMM 1.04 includes a custom MS-DOS interface for control, plus a comprehensive set of software communication tools to analyze, log and generate reports from the data. The spectrum log function can sweep a frequency spectrum at approximately 1300 channels/minute, generate a histogram, and log frequency/activity to the disk.

DELTACOMM 1.04 is priced at $300 (including external interface and components for cabling), plus $4 S & H. Contact *Delta Research, P.O. Box 13677, Wauwatosa WI 53213; (414) 353–4567.* Or circle Reader Service No. 203.

RUTLAND ARRAYS

Rutland Arrays has announced a new antenna, Model RA7-50. Model RA7-50 is a 7-element, 26'7" long, 50 MHz yagi antenna. It has a measured gain of 10.5 dB over a dipole, and matches the performance of other antennas measuring as much as 7' longer. The sidelobes have been lowered to 22 dB below the main lobe, and the F/B ratio is 30 dB at 50.2 MHz. The design features stainless steel element hardware, extruded aluminum element mounts, a T-match driven element with silver-plated, Teflon™-insulated phasing line, and 90+ MPH wind survival. A waterproof N-type coax connector is standard. For the price and more information, contact *Rutland Arrays, 1703 Warren St., New Cumberland PA 17070; (717) 774–5298 (7–10 p.m. EST).* Or circle Reader Service No. 207.

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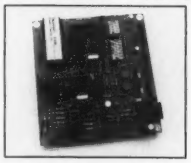

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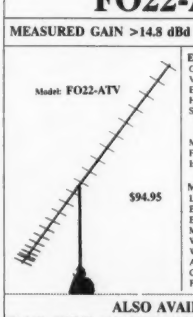

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Multiplication Factors: 12 Times
Power Rating: 2000 CW, 4000 PEP
Height: 10 Feet
Weight: 8.0 Lbs.
Materials: Anodized 6063T-6 Aircraft Aluminum Tubing
Requires 1 Coaxial Cable for Hook-up

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Multiplication Factors: Horizontal - 17 Times Vertical - 15 Times
Horz. to Vert. Separation: 20-25 DB
Power Rating: 2000 CW, 4000 PEP
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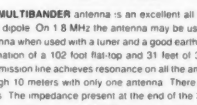

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T/R Controller to Drake

Picking up where we left off last month, we'll finish up the T/R controller. This month we'll look at how to interface the controller to the popular Drake R4B and/or R4C receivers. While we're working with the Drake receivers, we'll convert them over to cover all of the WARC bands. This is a simple modification consisting of nothing more than adding a crystal and peaking the front panel controls.

Of course, you don't have to have the Drake receivers to work with the T/R controller. But the following will give you a good idea of how to connect whatever station receiver you're using. The relays specified for the T/R controller need not be used. In the photographs of the final version, I use one onboard relay and a 4PDT relay mounted off the board. This relay does most of the work in my version.

Feel free to use whatever you have lying about in the junk box. Just keep in mind the coil current that you can sink with the two switching transistors. Also, you don't have to worry about adding a diode across the off-board relay's coil, since one is mounted on the board. If you choose to go with an external relay, just connect up the two pads used for the relay coil and run wires to the coil of the external relay.

Because the case I used for the T/R controller was not high enough for the relay I chose, I had to mount it sideways. I used a small piece of copper-clad PC board and a junk box nylon mount to accomplish this. I also spent the extra dollar on a socket to hold the relay. Mounting the relay on its side made wiring to the contacts very easy.

Speaker Mount

The sidetone generator requires a speaker, which I mounted on the bottom of the chassis. A small dap of Super Glue™ holds the speaker in place. After I did this, I thought the addition of some holes to allow the sound to come out of the chassis would be a good idea.

As a second thought, the speaker could be mounted upside down with some holes in the bottom of the chassis. This might make for a good sounding tone without creating a mess on the top of the chassis. I used a small 8 ohm speaker from the junk box. Radio Shack sells one for several dollars that will work fine.

Antenna Switching

As I mentioned last month, the antenna switching is done by another relay. I used a 12-volt junk box relay rated at 10 amps. This is more than enough for QRP use. I switch +12 volts to the relay. RCA jacks provide a quick and dirty way of supplying control voltage to the antenna switch relay. The +12 volts is supplied via the T/R controller.

For maximum flexibility in connecting up different rigs and transmitters, I also used two different types of connectors, RCA and SO-239, for the antenna and receiver/transmitter. The Drake receivers use RCA jacks for antenna input, so I use a cable with RCA plugs on both ends: one to the receiver, the other to the antenna switch. The main antenna terminates with a PL-239 that plugs into the proper SO-239 socket on the antenna relay.

Mute Confusion

The last and sometimes the most confusing connection required is the mute line. In the Drake receivers, the mute line must be grounded to operate the receiver, and open to mute the receiver. This switching is all done in the T/R controller. With the T/R relay, we have a choice of selecting ground or open muting, depending on how we wire the relay's contacts. A small shielded cable connects the T/R controller to the receiver. Since the Drake mute jack also terminates with an RCA jack, a suitable cable is used, RCA to RCA. I installed RCA plugs on the back of the controller for ALL functions.

The key-in line should be connected to your keyer/computer/straight key. To activate the T/R controller, you apply a ground to the key line. Since you're not switching heavy current or high voltage, you don't need to worry about damage to the keyer. Also, in the nasty and unlikely event the home-brew transmitter you're working on decides to short out its keying transistor, and feed +12 volts back through the key line, nothing will happen to your keyer. The T/R controller fully isolates the key output from the key input.

A simple block diagram may help with the interconnection. Use this only as a guide; nothing is carved in stone!

I've never been much of a receiver builder. As was the case when I started working on the T/R controller, I never could seem to get a home-brewed receiver to work as well as a commercially built one. But I wanted a really good receiver, one that'd allow me to listen in on the WARC bands. So what I ended up with was a Drake R4B. This receiver is not new by any means. It dates back about 15 years or so when real radios glowed in the dark. Yes, the ol' Drake has tubes in it. It also has one more thing of great importance: additional tuning ranges.

By inserting the appropriate crystals in the accessory crystal sockets at the rear of the chassis, it is possible to add up to 10 additional tuning ranges. Each of these is 500 kHz wide, except for the 5.0 to 6.0 MHz band. This is the Drake's frequency for the VFO. Anything else is fair game! I installed crystals for 28.000 to 28.500 MHz, 18.068 to 18.168 MHz, 24.890 to 24.990 MHz, 10.100 to 10.150 MHz, and several for shortwave listening.

The extra crystals are installed in the rear apron of the Drake. I ordered the crystals from Jan Crystals in Florida. Just have the frequency of the rocks you need, and they'll do the rest. In a week or two you'll get the crystals. This is the type of modification I like the best. Order the crystals, install them, and start working the new bands. I made up a cheat sheet to allow quick tune-up of the new bands, because the Drake will resonate the newly installed bands under different settings than one would think. For example, the 30 meter band requires the band switch setting to be on 14 MHz, while the preselector is at the 40 meter location.

That's about all there is to getting the Drake running on the WARC bands. There's a lot of life left in those receivers, and as the old saying goes, "You can't work 'em if you can't hear 'em." 73

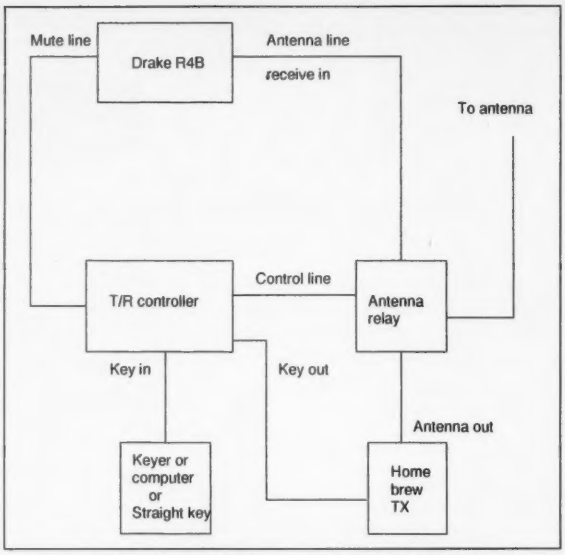

Figure. Block diagram of the interconnections for the T/R controller.

Photo A. A home-brew CW transmitter, solar-charged battery, and the Drake R4B receiver: QRP heaven!

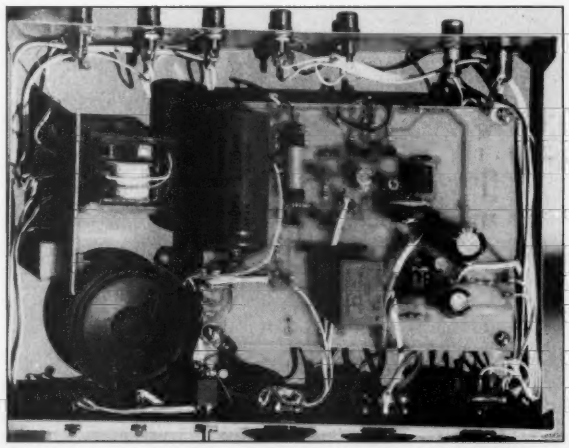

Photo B. Inside view of the T/R controller. Notice the relay mounted off of the board next to the speaker. There is one relay mounted on the board in this version of the controller.

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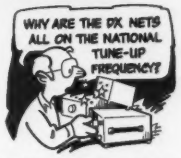

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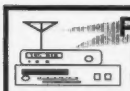

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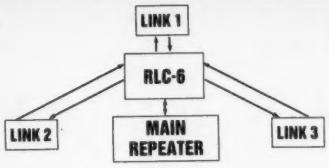

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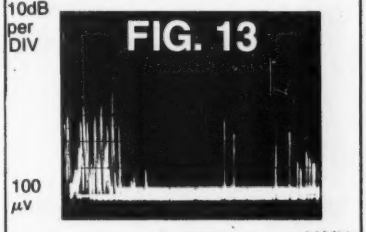

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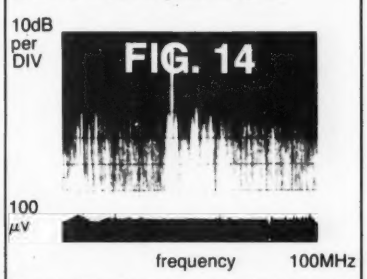

Wrong. Fig. 14 shows the effect of a drill operated on the same line. Momentary RF levels exceed the 70dB probe overload range. Even an SCR light dimmer puts out interference. Arcing insulation in an AC motor will exhibit high levels of "trash" — observable as significant change in line RF when energized. A thunderstorm is a real experience!

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R.S.#	page
109 A & A Engineering	71
164 Ace Communications of Indianapolis	58
83 Ace Systems	71
65 Advanced Electronic Applications	13*
253 Alabama Amateur Electronics	65
67 Alinco Electronics	33
194 All Electronics Corporation	39
• Amateur Electronics Supply	31*
4 Amidon Associates	69
89 Antennas West	34
5 Antennas West	47
107 Antennas West	67
90 Antennas West	71
138 Antennas West	17
135 Antennas West	81
236 Antennas West	71
16 Astron Corporation	25
243 AXM, Inc.	47,51
21 B & B, Inc.	65
262 Bailey Country Store	**28**
53 Barker & Williamson	53
41 Barry Electronics Corporation	23
42 Bilal Company	65
176 Bird Electronics	41
197 Brainstorm Engineering	81
84 Broadcast Technical Service	71
56 Buckmaster Publishing	81*
7 Buckmaster Publishing	17*
170 Buckmaster Publishing	47*
168 Buckmaster Publishing	51*
• Butternut Electronics	58
184 C & S Sales, Inc.	17
116 C.A.T.S.	65
251 Cable X-perts	67
• CB City International	79
80 Cellular Security Group	51
156 Commpute Corporation	69
99 Communication Concepts, Inc.	69
121 Communications Electronic	27
10 Communication Specialist	16*
146 Creative Control Products	81
29 Custom Embroidery	81
• Dayton Hamvention	37
256 Delta Research	58
257 Delta Research	49
• Down East Microwave	81
185 Electronic Engineering	47
128 Electronics Book Club	63
8 Elktronics	51
• Engineering Consulting	79
280 Excellent Technology	**28**
75 Fair Radio Sales	81
172 Gap Antenna Products	14
193 GGTE	47*
98 Gilfer Shortwave	53
17 GLB Electronics	85
72 Glen Martin Engineering	79
192 Grapevine Group	81
• Ham Radio Toy Store	71
57 Hamtronics, Inc.	11
179 ICOM America	CV2
77 Interflex Systems	69
270 J-Com	**69**
240 Jan Crystals	28
• Japan Radio	19
245 Jensen Tools, Inc.	47
260 Jo Gunn Enterprises	**69**
• K-Com	47
• Kenwood USA Corporation	CV4,5,6*
234 Lentini Communications	34
47 Link-Com	71
• M & N Electronics	79
25 Madison Electronic Supply	14
101 Maxcom, Inc.	71*
55 Meadowlake Corporation	81
241 Media Mentors	79
86 MFJ Enterprises	1
160 Micro Computer Concepts	77
144 Micro Control Specialities	85
231 Mirage/KLM	49
248 Motron Electronics	67
54 NCG	49,51
78 North Olmsted Amateur Radio	51
• P.C. Electronics	77,79*
178 Pacific Cable Comapany, Inc.	47
199 Palomar Telecom	67
264 Palomar Telecom	34
68 Periphex	35
249 Phillips-Tech	47
258 Polyphaser	**20**
132 Quement Electronics	65,77
24 Quorum Communications	53
31 Radio Amateur Callbook	57
76 Radio Engineers	17
34 Ramsey Electronics	29*
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244 Software Systems	49
250 Software Systems	41
51 Spectrum Communications	57
183 Spectrum International	39
247 Startek	15
87 TCE Labs	67
232 TE Systems	42
124 Texas Bug Catcher Antenna	58
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ABOVE AND BEYOND

VHF and Above Operation

C.L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119

Microwave Beacons

To round out last month's column on waveguide mixers and microwave formulas, this month I'll cover a typical 10 GHz microwave beacon. By changing the RF source and antenna, you can adapt the plans for this beacon to other microwave frequencies.

Unlike beacons on lower frequencies such as 6 meters, microwave beacons are not put up only to reveal current propagation conditions. If you heard a 6 meter beacon clearly, you would rush to the shack and start operating, looking for contacts on that band. But if you heard a microwave beacon from some remote location, you would, instead, get busy on the phone to set up contacts.

The microwave beacon not only alerts you to band conditions, but also serves as a piece of test equipment. During contests, the microwave beacon transmits a signal that stations can use to check antenna alignment and to prove that their stations are functioning normally. Most importantly, the microwave beacon provides a reference signal local amateurs can use as a transfer frequency standard. This way, the custodian of the beacon can verify frequency as accurately as he can (in the band, of course) and set the standard.

Frequency and Offset

In any large group, someone can come up with a best method of determining frequency either by wavemeter or frequency meter. The method used doesn't make any difference. When you have this type of system in place, all other stations can set their equipment to copy the beacon. You can set your system's frequency to either sideband mix product, offset by your IF frequency. This offset is determined by whatever IF frequency you are using. One standard is 30 MHz. For example, if the transmitter is on 10.250 GHz, you can copy on either 10.220 or 10.280 GHz, since both frequencies are in the 30 MHz offset due to the IF frequency.

When all local stations are copying the same beacon, frequency determination problems decrease. Until most amateurs in an area can agree on just where 10.250 GHz is, it can be a large stumbling block. Even if a beacon is slightly off-frequency, everyone in the local area using the beacon will be affected the same. What matters is that all stations in a local area know where the beacon is and use it.

Antenna Checking

With a microwave beacon, you can check your antenna direction pointing, and test the sensitivity of your receive system. Microwave antennas, especially dish types, can have beam widths of 3 to 4 degrees or less. This makes accurate dish aiming very important. Copying a local beacon, you can verify direction (compass bearing) and vertical position. This helps eliminate one more wobble in the system. Sensitivity can be verified by comparing results to past tests, or by placing an attenuator in the system for further tests. Use of a beacon has proved to be a valuable asset, letting you make quick assessments of system performance. Quick verification can be everything during contest weekend. See the beacon schematic in Figure 1.

The Beacon System

Construction of a 10 GHz beacon is quite simple. All you need is a source of RF, such as a Gunn oscillator, an identification system, and an antenna. The CW identification system, described in the June 1990 column, is just a simple TTL keyer with an EPROM loaded with your callsign. The unit repeats what is loaded into the EPROM over and over again, resettling after each message. The audio output from the keyer is coupled to the adjust terminal of a Gunn oscillator power supply, imposing wideband FM modulation on the Gunn oscillator.

In most beacon setups the power supply (unregulated DC) is remote to the actual beacon, with the Gunn oscillator/power supply modulator and keyer located within a common housing with the microwave antenna. The keyer is about the size of a pack of cigarettes and the Gunn oscillator is a compact structure about an inch and a half square. A short section of plastic drainage pipe is often used to house the entire system.

The Beacon Antenna

The antenna selected for beacon operation must be compact, high-gain, and omnidirectional to be of general use. What fills the bill is the near omnidirectional waveguide slot antenna. For 10 GHz, a waveguide slot antenna is less than a foot long; 6 slots (on each side of the waveguide) exhibits 10 dB gain. See Figure 3 for construction details.

The top of the antenna is shorted with a machined brass insert that closes off the top of the waveguide. A single waveguide flange connects the antenna. The Gunn oscillator may be directly connected to the antenna, or a magnetic isolator may be placed between the antenna and the Gunn oscillator. The isolator helps reduce pulling on the Gunn oscillator by allowing RF to flow freely in one direction, which provides high loss to reflected RF (VSWR).

The slots in the waveguide are vertical, in the same plane as the length of the waveguide. The radiated RF is *horizontally* polarized. To receive horizontally polarized radiation, your receive waveguide must be vertical (the longer opening of the waveguide). Having your waveguide *vertically* polarized means having the long opening of the waveguide horizontal. If this sounds confusing, just remember the rule: The

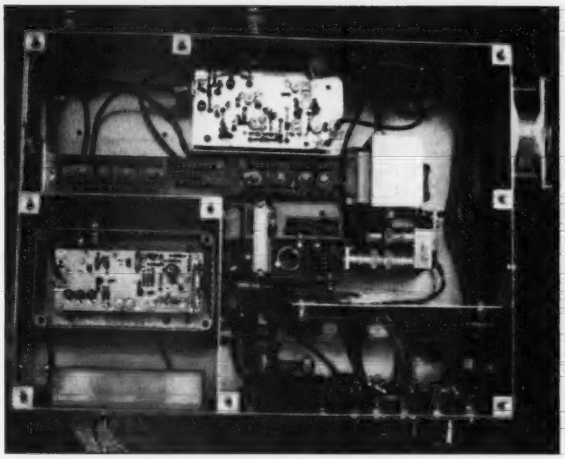


Photo B. "All mode" (CW, SSB, and NBFM) 10 GHz transverter constructed by VK2ALU. Oscillator chain and amplifier is a G4DDK design feeding a X9 SRD (step recovery diode) multiplier. The 10 GHz mixer section is a G3JVL design (image reject mixer) with output on 144 MHz.

Photo A. Lyle Patison VK2ALU of Wollongong, Australia, operating a 10368 MHz transceiver on SSB, testing over 80 km to VK2ZAC (who can receive on SSB but only transmit on NBFM). Note sighting telescope mounted below dish. A Cassegrain subreflector feed is used allowing more efficient illumination. The 20 inch dish is a searchlight reflector.

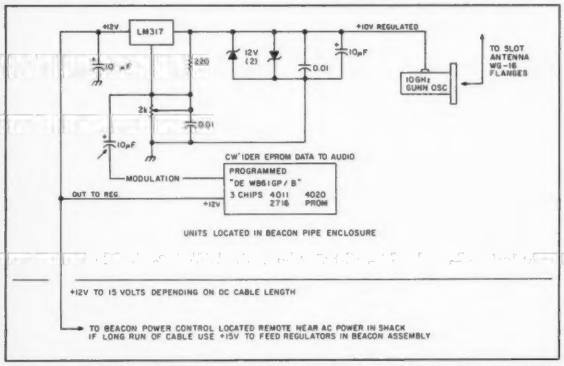


Figure 1. 10 GHz beacon showing CW ID'er and power supply. Regulator/modulator audio from ID'er feeds to adjust terminal of regulator for modulation on input on regulator output voltage to Gunn oscillator, which produces high quality wideband FM on 10 GHz (See "Above and Beyond" in the June 1990 issue of 73 for CW ID details).

polarization is opposite to the long opening of the waveguide.

If you try to copy a signal of the opposite polarization to what you're running, this will add an additional *30 dB loss*—yes, 30 dB loss—on your end of the circuit. This really makes it difficult to copy signals. Rotating the waveguide or system 90 degrees will help.

Mounting the System

The keyer, Gunn oscillator, and slot antenna are mounted inside a short section of 4" O.D. plastic drainage pipe with top and bottom cap plugs, available at most hardware stores, to waterproof the assembly. DC power is supplied via the cable to the regulator assembly located in the pipe. We usually provide 12 volts at the power supply and regulate the Gunn DC to 10 volts, and the keyer to 5 volts. DC loss is not a problem for moderate lengths of cable; for longer lengths, use 15 volts DC. See Figure 4.

Three beacons have been operating in the San Diego area for at least several years. Maintaining these beacons are Jack N6XQ, at his home on Point Loma overlooking the Pacific; Ed W6OYJ, at his home in University City just north of San Diego proper; and Kerry N6IZW, on Mt. Helix. The latter has served many hams for the years it has been in operation. All have proven valuable tools for microwave use.

Alternate Test Source

If you do not have a beacon or a signal generator in your area, for simple tests you can use the "boomerang," a test oscillator connected to the waveguide detector for the band of interest (10 GHz in this case). You must be using wideband FM and an IF system like the TDA-7000 IF amplifier ("10 GHz Fun," in the April 1990 issue of *73*) which has an IF amp operating at 30 MHz. It's easy to build. All you need is a crystal oscillator at 30 MHz coupled into the detector mount. Don't forget to provide a DC return (RFC) for the detector diode.

When the boomerang receives RF (from the transmit unit), it mixes the received RF with the 30 MHz oscillator and produces a return signal plus and minus 30 MHz back to the transmitter. This signal is not frequency dependent; it will work with any IF (change the crystal to your IF frequency). Also, it does not matter what your 10 GHz frequency is. In this regard, it is very poor to useless for frequency determination, but it gives a low level signal for testing.

Mailbox Comments

Junji Tamura JH1MOY of Japan is gathering components for a 10.475 GHz system. I must admit I do not know the band structure for Japan, but I am looking into this to find out which frequency the activity there is centered on. I hope to have more information on Junji's progress and other microwave activities from Japan.

Ammar Talhouni of Jordan writes that he is finding the microwave articles very interesting, but he is having trouble obtaining materials to construct the Polaplexer mixer and finding a source of Gunn diodes. He would appreciate any assistance. Well, Ammar, I would be glad to provide parts for the Polaplexer. The only additional charge would be for overseas airmail.

Shipping components to any part of the U.S. or Canada isn't a problem, but restrictions on exports to some countries might apply. According to the U.S. Export Administration, items such as Gunn diodes were restricted under tariff ECCN 1544A subpart b,1, but this restriction has recently been lifted. This makes shipment easier, as it now comes under the "general destination" category instead of "controlled tariff."

Kurt AL7LQ/3, a member of the U.S. Coast Guard, reports that he has moved from Kodiak Island, Alaska, to Laurel, Maryland. I know this will add some microwave activity to that part of the woods. Kurt is looking for information on an 11 GHz phase-locked brick manufactured by Micromega, and also for any information on a Huggins Labs TWT power supply model 328D. If you can help him out, write Kurt at 11658 S. Laurel Dr., #2 D, Laurel MD 20708.

Lyle Patison VK2ALU of Wollongong, Australia, writes about 10 GHz operation Down Under. He says it's difficult to obtain microwave components there. Despite this, he used a transformer he got from a microwave oven to construct a 1-watt TWT power supply for a surplus tube. Lyle states that this arrangement works well, but it's not too portable. I have to take my hat off to Lyle, as building a TWT power supply is no small undertaking. It's one that I (with all the components I have available) won't consider.

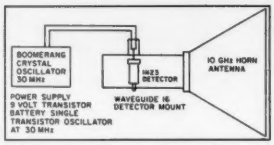
Lyle says there are two other amateurs in Wollongong on 10 GHz, one on SSB and the other on FM. There are two other SSB amateurs in Sidney, but Lyle says he has a 45 degree elevation rise in their direction, and has to use scatter propagation to make the 60 to 70 km path. See Photos A and B, showing Lyle and his very well-built, home-constructed equipment. His accomplishments are amazing—and in a location where microwave items are scarce. Keep up the good work, Lyle.

Kits and Parts

All kits and Gunn devices that I have mentioned in previous columns are still available at the same prices. Got to hold the line and keep things inexpensive. The only item that has proven difficult to get parts for is the ferrite antenna for VLF frequency calibration.

Add to this list of items the 10 GHz slot antenna described in this column. I have had them fully machined and constructed for those who do not wish to do it themselves from the instructions in Figure 4. The cost of the machined waveguide assembly, end cap, and high quality, commercially gold-plated waveguide flange, is $40 postpaid U.S. The antenna, as machined, exhibits an SWR of less than 1.1:1, about 32 dB return loss. The antenna assembly can be soft-soldered or brazed together in a few minutes. All three parts are a tight fit for final assembly. The flanges included in this kit cost just under $8 each, which was quite a shock to my system. Thought they should run about $4 for new flanges; boy, was my estimate in error.

As always, I will be glad to answer any questions relating to microwave or other topics. Please send an SASE for prompt reply. Chuck WB6IGP.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WAVEGUIDE 16 DETECTOR MOUNT

Figure 2. The boomerang. The microwave return signal test adapter receives 10 GHz RF and mixes with 30 MHz. Local oscillator and return microwave RF USB and LSB mix at 30 MHz spacing for receiver testing and antenna aiming tests.

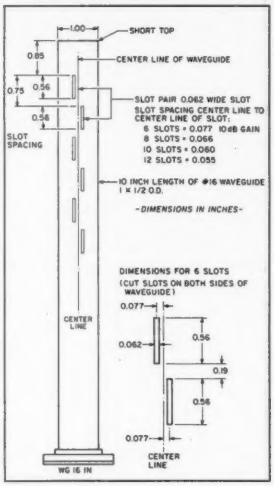
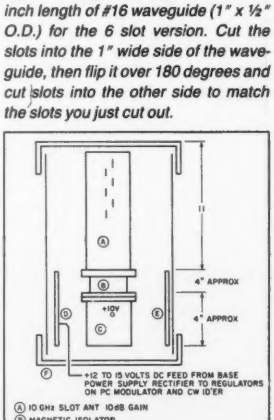


Figure 3. 10 GHz omnidirectional slot antenna, horizontally polarized with approximately 10 dB gain. Use a 10 inch length of #16 waveguide (1" x ½" O.D.) for the 6 slot version. Cut the slots into the 1" wide side of the waveguide, then flip it over 180 degrees and cut slots into the other side to match the slots you just cut out.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C GUNN OSCILLATOR
D POWER SUPPLY MODULATOR PC BOARD
E CW ID'ER PC BOARD
F 4 INCH PLASTIC PIPE CAP PLUG

Figure 4. 10 GHz beacon system package. The waterproof DC cable exits from unit at the bottom. Attach a clamp to secure it. Do not place objects near the top of the antenna.

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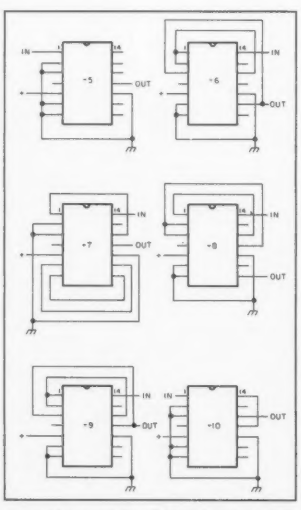
CIRCUITS

Great Ideas From Our Readers

The Versatile 7490 IC

The 7490 (74LS90, etc.) is specified as a decade counter, dividing TTL pulses by a factor of 10. What is not so well known is that this chip can be connected to divide by any whole number between 5 and 10. This lets you use cheap surplus crystals when building a crystal calibrator—secondary frequency standard—which should be in every ham station.

Because published circuits and commercial crystal calibrators use 100 kHz, or 1, 2, or 4 MHz crystals, dealers price these crystals higher than other surplus crystals. Using a 50c 7490 IC following any crystal oscillator using a 5, 6, 7, 8, 9 or 10 MHz crystal, output at 1 MHz is produced by properly wiring the 7490. This can be divided further if you wish, using a combination of dual flip-flop 7474s to produce the more usual 100, 50, 25 and 10 kHz marker frequencies (see "An HF/VHF/UHF Marker Generator," *73*, January 1991, p.27). The figure shows the connections which allow the 7490 to divide by 5, 6, 7, 8, 9 and 10.



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HAMS WITH CLASS

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Space—The Final Frontier

A classroom visit from Captain James T. Kirk of the *Starship Enterprise* could not have generated more excitement than the radio contact with two real-life astronauts that we had recently.

In early October, I was planning my strategy for introducing a unit on "Space Travel and Communications." I incorporate a major area on space in my ham radio curriculum every term. There is such an abundance of material that I've never taught it the same way twice in more than 10 years. This is a favorite area of study for my 6th, 7th, and 8th graders.

I finally decided that a great opening lesson would be to show an old science fiction movie from the 1950s and compare it to the tapes of shuttle launches and the SAREX tape from the ARRL. Purely by coincidence, when I opened up a session of the CQ All Schools Net, Jay Apt N5QWL was my first check-in. Jay introduced himself as an astronaut from the Johnson Space Center. He had heard about our net with schools across the country, and he wanted to get on and chat with the youngsters. I'm not sure who was more excited—the students or the teacher—but I do know that there was a smile on everyone's face that afternoon.

Jay spoke to the children about plans for future shuttle missions, and about how much he was enjoying ham radio himself. He made a big impression on the youngsters by telling them about the importance of getting a good education and of considering technical careers. There was electricity in the air! Within minutes of the end of the contact, the rest of the school knew about our good fortune.

For days after the contact, parents contacted me to verify that it was all true, and to find out what we were doing in the ham radio program. What an incredible kickoff to my unit on space communications!

During the next four weeks, the children produced some of the most creative and well-researched reports and projects I have ever seen. Even the more "reluctant learners" came through with flying colors as they presented puppet shows with pipe cleaner astronauts and popsicle-stick space stations.

In the midst of this flurry of space-related activity, on November 13, John WD5EEV, our friend from the Johnson Space Center, checked into the CQ All Schools Net with a special guest. He cryptically told us "This will make your day." He was right! Next at the mike was Ron Parise WA4SIR, to say hello to the children. Once again, the excited looks of delight from the youngsters were a sight to behold. Ron told the class that the crew from the SAREX mission STS-35 was at the Johnson Space Center in preparation for the December launch of the *Columbia*. He also stressed the importance of getting a good education and encouraged the kids to think about entering technical fields of study.

I was privileged to observe the intense looks of pleasure on the faces of the children as they listened to the comments of a man about to go on a space voyage. It occurred to me that the astronauts are the real heroes of our times. The men and women who risk their lives and dedicate themselves to the expansion of scientific knowledge are the ones who are truly worthy of our respect and admiration.

While it may be true that you can't initiate every space unit with a live contact from an astronaut, there are countless high-motivational lessons that can be used to spark the children's imaginations.

The following are a couple of sample lesson plans. If any teacher is interested in getting copies of other space lesson plans, just drop me a line and I'll be happy to mail them to you. Please let me know about creative and successful lessons you are doing with your classes.

Lesson Plan—Shuttle Travel

Lesson Aim: To learn about space shuttle travel.

Motivation: Have students put up space shuttle posters in the room. Ask them to bring video tapes of launches that they taped at home from the TV news. Show the videotape "Space Camp," the ARRL videotape "SAREX," and other related tapes. Point out the role of communications in space travel.

Background: The U.S. space shuttle, the world's first reusable spacecraft, first flew in 1981. After reaching orbit, its two solid fuel booster rockets are jettisoned and then recovered. Its main fuel tank is released when empty; it burns up on re-entering the earth's atmosphere. The orbiter craft—the heart of the space shuttle—looks and lands like an airplane minus the engine. Special heat-resistant ceramic tiles protect it from burning up on re-entry. There are three orbiters in the U.S. shuttle fleet. The shuttle's cargo bay can carry satellites, scientific equipment, or a complete space lab.

Activities, Science or History: Have students research and report on Sputnik 1, the first satellite to orbit the Earth, or any other mission since then. Have committees report benefits to us from missions, such as international communications and TV links via satellite; weather satellites aiding in weather predictions used by farmers, sailors, and airlines; and even hams getting a chance to talk to astronauts while in space!

Activities, Language Arts: After viewing videotapes, elicit responses on what it would feel like to be launched into space. List words on the board appropriate to age level: dizzy, euphoric, light-headed, amazing, unreal, awesome, and so on. Discuss each word and have students write a paragraph describing how they'd feel during lift-off. Have students write a science fiction story about astronauts "lost in space" without their radios.

Lesson Plan for Spacelab

Lesson Aim: To learn about Spacelab missions.

Motivation: Say to students: "Imagine factory workers reporting to work in space. Does this sound far-fetched? Maybe not."

Background: November 1983, the space shuttle *Columbia* was launched with Spacelab 1 in its cargo bay. Spacelab was designed as a place where scientists could do experiments in the unique environment of Earth orbit. Due to weightlessness conditions in Spacelab, handrails and foot restraints were installed to prevent scientists from floating about.

Spacelab has a pallet (storage platform) where materials and equipment can be exposed to space and remotely handled by the shuttle's manipulator arm. The first Spacelab mission lasted 10 days.

Activities, Science or History: Have committees research the benefits derived from Spacelab missions: Group 1), animal research; Group 2), electronics/communications; and Group 3), drugs/medicines. Examples: 1) manufacturing silicon chips (used in computers) could be performed more accurately and economically in space; 2) conditions in space make drug-manufacturing easier; and 3) electrophoresis, using an electrical current to separate materials dissolved in a liquid, can be done with a greater degree of purity in space.

Activities, Art or Language Arts: Have students submit sketches of what a space "floating factory" might look like, then describe it. Have them write a composition telling what kind of people could work there. Describe what it would be like to live in the Spacelab for several months. One thing workers could do during nonwork hours (if they got their amateur license before the mission) is talk to family and friends on Earth by making contacts via amateur radio. 73

The crew of mission STS-35.

ATV

Ham Television

Bill Brown WB8ELK
%73 Magazine
Forest Road
Hancock NH 03449

Cross-country ATV Adventure!

On a clear morning this spring, the door to a large blimp hangar in Orange County, California, will open to reveal a 75-foot diameter balloon, a gondola suspended high in the air just below the balloon, and a large ballast balloon on the bottom (see Photo A). Three daring balloonists will ride in the gondola as they attempt a nonstop cross-country flight.

This is a warm-up flight for their nonstop round-the-world flight scheduled for this November. Dubbed *Earthwinds*, the November flight will fly in the jet stream at a constant altitude of 35,000 feet. The three balloonists will ride in a special pressured gondola (see Photo B) suspended between the helium balloon and a unique ballast balloon. The ballast balloon is what makes the mission possible. Its weight can be adjusted by varying its internal pressure through means of a high-pressure fan and release valve. This means that very little ballast needs to be carried, resulting in very long flight duration capabilities. If the winds are favorable, it should take from 11 to 20 days to circle the globe.

Onboard the gondola in November will be captain Larry Newman KB7JGM, Maj. Gen. Vladimir Dzhanibekov (director of cosmonaut training in the Soviet Union), and Richard Branson (who just completed the first hot-air balloon crossing of the Pacific—Newman was the first to cross the Pacific in a helium balloon in 1981).

Since flying with the historic trans-oceanic balloon crossings of Double-Eagle II (Atlantic) and Double-Eagle V (Pacific), Larry Newman has dreamed of the ultimate ballooning conquest of a nonstop round-the-world flight. After years of planning, it could be a reality this spring.

Work a Balloon

Larry KB7JGM, a very enthusiastic ham, is quite active on 10 meter SSB (recently he's been found around 28.385 MHz). He is a pilot with America West Airlines (see Photo C), and soon plans to operate on 20 and 15 meters while on his twice weekly coast-to-coast Boeing 757 flights.

During this spring's balloon test flight, he will be active on 20, 15 and 10 meters. Listen on 28.385, 21.385 and 14.330 MHz for KB7JGM/balloon throughout the flight. When Larry is not operating live from the balloon, he may have a talking-voice beacon operating on 28.385 MHz to relay their altitude and position. Hopefully schools nationwide can monitor these transmissions and plot the balloon's path as it drifts across the country.

Live ATV from 17,500 Feet

In addition to Larry's HF activities, he plans to operate a complete ATV station! A live color camera attached to the railing of the gondola can be remotely pointed via a 2 meter control link when Larry is busy with other activities. When Larry is not receiving ATV, he'll be transmitting spectacular views of the Earth below that can be seen on 434 MHz (439.25 MHz alternate). Those of you with cable-ready TVs or VCRs can tune in on cable channels 59 or 60 (as long as you connect an outside antenna). Since they plan on flying at 17,500 feet for the cross-country effort, anyone within 160 miles of the flight path should be able to view the ATV signal or contact Larry on 2 meters. He will be monitoring 144.34 MHz FM as well as the HF frequencies.

Larry can operate with either vertical or horizontal polarization on ATV. During each night, there is the possibility of a cross-band ATV repeater mode: 434 MHz input/1255 MHz output (AM or FM).

Two lines of telemetry will be displayed at the bottom of the screen showing the altitude, latitude, and longitude; and the temperature, ground speed, and heading. This is accomplished with the aid of a Magellan GPS (Global Positioning Satellite) receiver interfaced to flight computer/video overlay board available from High Technology Flight. The telemetry overlay system was designed by Bob Rau N8IYD and is similar to that used in previous balloon experiments (see High Altitude Ballooning, Photo E in the August 90 issue of *73*). *For more information contact Bob Rau N8IYD, 1450 Jeffery St., Ypsilanti MI 48198-6319. Telephone: (313) 482–2670.*

Flight Path

Typical spring wind patterns could take the crew along a path across southern California, Arizona, New Mexico, Kansas, Iowa, Illinois, Indiana, Ohio, Pennsylvania and into New York state. The flight could take between 2 to 4 days to complete. Keep in mind that this is only an estimate of the actual flight path. A few days before launch, the actual flight path should be easier to predict.

Due to the current world situation, plans for this spring's flight could change. Listen to the AMSAT nets, the ATV net (3.871 MHz, tues. at 8 p.m. EST) and packet BBSs, for updates. 73

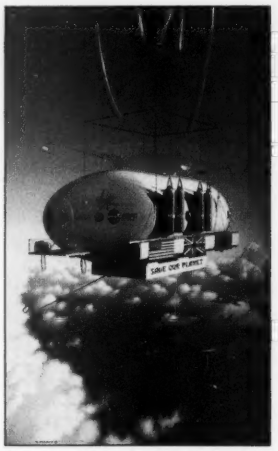

Photo B. Pressurized gondola which will be used for the round-the-world flight at 35,000 feet this November. Artist rendering by Stan Stokes.

Photo C. Larry Newman KB7JGM, America West Airlines 757 captain, and captain of the Earthwinds *balloon. Photo courtesy of America West Airlines.*

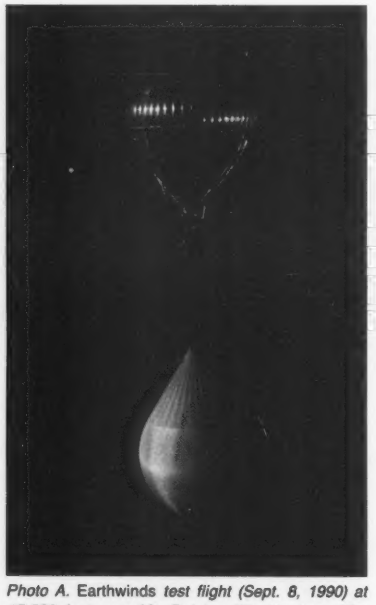

Photo A. Earthwinds *test flight (Sept. 8, 1990) at 17,500 feet over Mt. Rainier, Washington. The March test flight balloon is identical to this system. Photo by Mark Greenberg/Visions.*

Photo D. With an ATV receiver you'll be able to see spectacular views such as this one. Don Moses (backup crewmember for the Earthwinds *flight) is dressed in his cold weather gear near the radio operating position. Test balloon at 17,500 feet over Mt. Rainier, Washington (immediate background). You can see Mt. Adams, Mt. Hood, and Mt. St. Helens in the distance. Photo by Larry Newman KB7JGM.*

Desert Voices

Continued from page 18

case another message comes through, and not bother with seeking publicity. The gratitude and recognition of the people you help may be enough for you personally. But no publicity means the larger community remains ignorant of what you're are doing.

In fact, many people have only a vague idea of what a ham is or does, and some may wonder if there is such a thing as a ham anymore. For example, in the first 38 years of my life, lived in five different parts of the country, I only met ONE ham. Though I knew him for 10 years, I didn't know he was a ham until I moved a couple of thousand miles away and began working for 73 Magazine*—and received a letter from him! Hams love to tune in the world on the air—but they forget to tell the world in person.*

Young people are especially affected by this lack of an image for the amateur radio operator. If they have never heard about amateur radio or met a ham, they cannot easily picture them in their minds. Yet young recruits are what amateur radio needs most of all. So, do it: Tell the world. 73

To send a message through Desert Voices to a loved one in the Middle East: First, please write for the proper forms. Address your request to: *Desert Voices Project, POB 23057, Minneapolis MN 55423.* Please do not call on the telephone unless it is absolutely necessary. If it is truly an emergency, and you *must* call to order a form, the number is (612) 463–7202. The office staff is not large enough to handle many incoming calls, and they would not like to have the line blocked.

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We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 *BBS /Hamhelp SIG. (2400 baud, 8 data bits, no parity, 1 stop bit. (603) 525–4438). Use upper- and lowercase letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. Thank you for your cooperation.*

I need a schematic for ICOM-726. Mine was destroyed by a pet. Also, I would like to correspond with someone interfacing a Tandy Model 100 with the GLB-PK1L TNC. *Rick Thompson N0HKE, 2079 111th Lane, Coon Rapids MN 55433.*

Does anyone know where I can get a copy of a book called "The Ten Meter FM Hand Book," by Bob Heil? It's been out of print for about five years. I will pay copying charges for this book. *Bret Singer N3IHM, PO Box 1015, East Stroudsburg PA 18301.*

I need a schematic diagram for a Randix stereo cassette receiver, Model #SCR-7104. If you have a mailing address for the Randix Company, please mail the address to me. *Mr. John Sprenkle, 630 Cherokee Ave., Melbourne FL 32935.*

I have a young son with Down's Syndrome, and I would like to increase his speech ability using a speech synthesizer. Has anyone tried to interface Texas Instrument's French Speak & Spell to a computer? I would like to know how to go about making such a modification. I already have the schematic diagram for the Speak & Spell. Or would anyone know of a French speech synthesiser at an affordable price? Thank you. *Gregory McKenna VE2AGY, 33 Marcel, Valleyfield, Quebec, Canada J6S 4M4.*

I just bought a Tandy TRS-80 Model 4D, and cannot find amateur radio related software. I would appreciate copies of Public Domain or Shareware programs. I will pay postage and expenses. *Ibrahim Picard N5LYP, 501 Hudson Drive, Westlake LA 70669.*

I have a Telequipment Model S54A, 10x6 cm display, oscilloscope. The unit has no trace and I need a schematic and/or manual (even an address of the company) in order to complete the repairs. *Steve Reese KE8KF, N11.152 HWY M-95, Channing MI 49815.*

I have a Johnson Viking Invader 2000 6-band transmitter, without a power supply. I need a schematic and/or manual (or address of the company) in order to complete the repairs and build a power supply. *Steve Reese KE8KF, N11.152 HWY M-95, Channing MI 49815.*

Wanted: Instruction book for a Regency Whamo 10 scanner, Model ACT-W10. *R. Fuechsel, 12 Cove Lane Rd., Whippany NJ 07981. (201) 887–4034, evenings.*

I'd like to get in touch with someone who has a manual for a Cushman Electronics Model CE-4B Service Monitor. I'm trying to repair one and I need a copy of the service manual. I will either reimburse you for your copying and postage expenses, or you can mail me the manual and I'll copy and return it. Thanks! *Peter Simpson KA1AXY, 12 Ruthellen Rd., Holliston MA 01746. (508) 429–7069 (home) or (508) 870–9837 (work).*

Wanted: Collins R390 receiver service manual. *Lionel L. Sharp VK4NS, 19 Kelso St., Chermside, Brisbane, Queensland 4032, Australia.*

I need an operating manual and schematic for a Regency HR-2B transceiver. Will pay for copying and mailing. *Doug Stubbs, 69 Goff Rd., Lot 20, Corning NY 14830.*

I would like to obtain any mods available for the Bearcat BC760XLT, particularly increased audio and cellular phone info. *Chuck Kilch, 6083 Deer Run, Middletown OH 45044. (513) 890–7700.*

Wanted: Schematic diagrams for the Yaesu MH-12 speaker/microphone, Heath HW-2 2 meter handheld transceiver. *Glenn Torres KB5AYO, Rt. 1 Box 580-B, Reserve LA 70034.*

Wanted (desperately): DG-5 digital display for mint TS-520. I also need DK-520 kit for installation. I will pay top dollar. *Roger W7LJD, 1690 Allison Rd., Piney Flats TN 37686. (615) 538–8787 (call collect).*

Wanted: Schematic and manual for EICO 753 SSB transceiver. Will pay expenses. *Thomas McWilliams KI4N, 2600 N. Glebe Rd., Arlington VA 22207.*

I'm looking for a software program for the Commodore 64, to run an AMTOR BBS. *Howard Bacon, 213 Holly Ave. So., Pittsburg TN 37380-1313.*

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How to Break Your Radio

In previous columns, we've explored many aspects of equipment repair, from setting up your shop to an overview of the diagnostic process, to the details of stage-by-stage repair. In each case, though, we've assumed nothing about the rig's history up to the point of repair. Often, that's a good approach, because you just may not know why the thing failed. If you do know, though, that information can provide very valuable clues which can save you lots of time and effort. So, this month we're going to look at ways you can break your rig, and what to look for afterward.

Oops. . .

Here, hold this while I. . .whoops, CRASH! And that new rig lies crumpled at your feet.

Yes, dropping a radio will usually break it. Sometimes it may appear to work, only to quit a week later. Typically, though, it will exhibit obvious physical damage, and it will malfunction in some major way—like being completely dead.

A dropped rig may be more reparable than you think. Sure, you probably will have to order some new case parts, but the insides may not be ruined. Let's look at what usually happens.

If there's glass, such as a faceplate over a digital readout, it probably will be broken. The readout itself, if fluorescent or LCD, may be cracked and ruined. Especially with a fluorescent readout, check for breakage before powering the rig up. Those readouts use fairly high voltages (around 90 volts) and a damaged one can short and destroy the driver chips or the transistors that run it. A broken LCD will be obvious, with a black line or ooze around the crack. Be careful, because the liquid crystal material inside is toxic. If you get any on you, wash up carefully—you don't want to ingest any of this stuff. And, of course, don't cut yourself on the glass.

The most common kind of internal damage is to the printed circuit board. A cracked board will cause all kinds of problems, and the cracks aren't always easy to find. If you suspect a crack but don't see it, look around the corners and near the edges of the board. Also, check near large parts like transformers, heat sinks, and switches. These areas are especially vulnerable. If you do see a crack, try to determine which circuit traces are affected. Sometimes you can simply bridge a few broken lines and be back in business. Other times, it's not that simple. Today's complex products, and especially miniaturized items like HTs, often have multilayer boards with conductors running *through* their centers, or in layers underneath the visible one. In cases like that, the rig may truly be irreparable. I've tried a few times, but I've never had any luck fixing cracks in multilayer boards.

Solid-State and Surface Mount

Solid-state parts, such as chips and transistors, are not very sensitive to mechanical shock, and you really don't have to worry about them unless they have visible cracks. Glass diodes are an exception, as they break in half rather easily. Other parts should be examined. Leads can break off from electrolytic capacitors, and ceramic caps can crack in half. Coils, especially those with hair-thin wires (such as IF coils), can break those wires from their terminating pins. The iron cores can crack, leaving the coil way off frequency, even though it still functions. In particular, resistors tend to break with tiny, invisible cracks. Sometimes they'll still work intermittently, as the two halves touch and separate with temperature. To be sure, wiggle any suspect resistors slightly. A cracked resistor will usually separate when moved.

Surface-mount parts are another story altogether. They are soldered with low-temperature solder in a reflow process, which is something like reheating previously soldered connections without adding new solder. In my experience, the joints are much weaker than the normal kind, and a drop to the floor may create some touchy intermittents. The parts themselves seem pretty strong, but test any iffy ones just like you would resistors. Of course, if the part breaks, you are almost certainly going to have to try to decipher its function (resistor, cap, etc.) and value from a schematic, because many surface-mount devices (SMDs) are unmarked. That's the price you pay for a full-function walkie you can slip into your shirt pocket.

If the rig fell on the switches, they may be bent or broken. Order new ones. The same goes for connectors, knobs, and moving parts in meters. Surprisingly, you may find that small incandescent lamps have survived the drop. They just don't seem to have the mass to break. Also, LEDs almost never succumb to mechanical failure.

Ben Franklin Was Right

Lightning *is* electricity. And if it hits your antenna or your power lines (the more common entry point), bye-bye radio. A direct hit is likely to do so much damage that the rig may actually melt! Most strikes, however, are not true hits. In many cases the bolt hits somewhere close by, and the surrounding charge, which is enough to knock you straight to the morgue, is what zaps your rig.

As mentioned above, many lightning strikes come into your home through your AC wiring. There's lots of wire out there above the streets, and it's all a handy target for a discharge. So, if you've been hit and the rig is dead, go straight to the power supply. After unplugging it, check the transformer for continuity. Check the fuse. Undoubtedly, the rectifiers and regulator will be open. After replacing them, you may find that there is no other damage.

If you do get hit in the antenna, the rig's front end is probably fried. FETs just don't like megavolts instead of microvolts! If there's an antenna relay, it may be fused into the receive position for eternity. A new one will do the trick. If you have solid-state (diode) TX/RX switching, many of the diodes may be destroyed. This can be tricky because there are so many of them, and you might have to check them all. Sometimes just finding them can be hard. I remember one HF rig which had a shorted switching diode (not due to lightning) that I just couldn't find. Six hours later I found it buried in a corner of the board, under some other parts. It wasn't in the service manual or the schematic. Grrrrrr.

We don't always rely on Mother Nature to zap our equipment; sometimes we do it all by ourselves. Particularly in the case of new amateurs, there can be considerable confusion about the proper connections for power, audio, etc. A great deal of this is due to poor manufacturer documentation, with ambiguous wording and linguistic translation errors.

Polarity

The easiest and most commonly performed mistake is reversing the power polarity on 12 volt DC gear. It's amazing how often this happens. Once and for all time: *Red is positive (+) and black is negative (−).* Always. Really. And in a car, the chassis is negative and should go to the black lead. That is, unless you have an old, exotic European car like a VW bug.

If you do reverse the polarity, you will probably see smoke come out the back of the rig. Believe it or not, that doesn't mean the radio is destroyed. Many sets have protective diodes across their power leads. The diode is connected backwards so that it doesn't conduct in normal operation. When the polarity is reversed, the diode conducts, taking nearly all the current and protecting the rig for the few milliseconds before the external fuse in the DC power line blows.

At least, that's the way it's supposed to happen. Unfortunately, many people don't bother to fuse the power lines, so the diode conducts just like a continuous short circuit until it smokes and/or explodes. All of this can occur in a second or two. If the diode opens, which is likely, the rig will get the full brunt of the reverse voltage and be seriously damaged.

First, check the diode. It may be shorted, and there may not be any other trouble. If not, or if there is no diode, head straight for the voltage regulator. It is probably open. Sometimes a new regulator is all you need, because the old one's opening has protected the rest of the circuitry. Oh yes, be sure to replace any electrolytic capacitors connected before the regulator. Those caps just won't tolerate *any* reverse voltage. If reverse power has gotten to the rest of the circuitry, check power devices, such as audio power amps and RF finals, before anything else. Many low-level-stage parts, such as ICs and transistors, are connected through resistors or secondary regulators and won't be damaged. Small-signal diodes are almost never damaged by a power reversal. After all, they are designed to block reverse voltage anyway.

Cap'n, She Can'na Hold

High SWR will make your RF come back at you. Although all solid-state HF rigs have protection circuitry, sometimes it may not be enough. Also, some VHF/UHF rigs have no protection. At least on HF, common causes of high SWR include operator error (oops, forgot to turn off the auto antenna tuner when I changed bands), momentary mistuning of manual tuners, and antenna failures or coax damage. Generally, rigs will tolerate short-term SWR problems, but they don't like it for too long. That's one area where tubes definitely were better.

Typically, SWR damages the RF finals. They often open, so there is no RF power out. They can also short or become leaky, which will result in very low power out and probably some distortion. And, perhaps, a rather warm rig. The SWR protection circuitry may also be damaged and should be checked first.

Microphone input circuits are designed to accept small AC signals. They may be damaged by DC power or severe overload due to excessive input signals. I don't mean yelling into the mike; I mean connecting the earphone output of a tape recorder and turning it up nice and loud. Check the first transistor or IC for an open circuit.

Audio output jacks are a prime source of trouble. A short will very likely destroy the audio power amp. It is best to turn the rig off before connecting an external speaker, because the jack can short for a moment as the plug is slid in or out. Now and then, that moment is enough to cause damage.

Never ever connect two audio outputs together. Inexperienced operators sometimes do this because they want to mix two radios into one speaker. This is almost certain to damage both rigs! If you need to mix, buy or build a suitable mixer circuit which will isolate the two radios' outputs and avoid the damage caused by one rig's audio power frying the other rig.

Any time a radio is damaged via the speaker jack, head straight for the audio power amp. Also, check for the presence of an electrolytic capacitor between the amp and the jack. If there is one, replace it; it is almost certainly leaky or shorted.

Well, that's it for this month. See you again next time.

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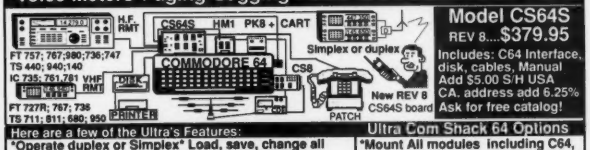

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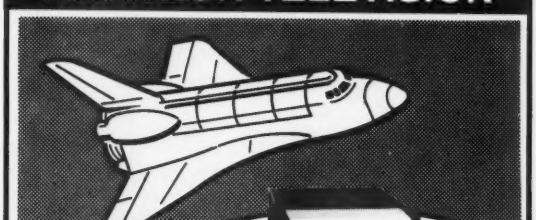

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VK9 Norfolk Island: Ham Radio and Stamp Collecting

The Norfolk Island Philatelic Bureau has announced the issue of three stamps commemorating ham radio. The set of stamps will be issued April 9, 1991. The stamp designs feature different maps of the island and the callsigns of the island's five amateurs: VK9JA, VK9ND, VK9NI, VK9NL and VK9NS. Values: 43¢, $1.00 and $1.20. A first day cover will cost $2.83 (Australian $). Additional information may be obtained from (or orders mailed to) Philatelic Bureau, Norfolk Island 2899, Australia. Thanks, VK9NS.

TN6PG and TN6PG/D2

The operations by TN6PG and TN6PG/D2 are thought to be the work of a pirate. The operator is said to QSL via G3OCA, who knows nothing about these stations.

ZS9Z/1 1990 DXpedition to the Penguin Islands

DXpeditions don't just happen, and they are not necessarily vacations. A successful DXpedition requires detailed planning, logistical support, research, and dedicated operators. The following DXpedition report, provided by N7NG, tells part of the story of the second DXpedition to the Penguin Islands of South Africa.

The South African (RSA) Penguin Islands are located off the coast of Namibia, with Namibia left in between as an "intervening DXCC country," thus qualifying the Penguins as a separate DXCC country under Points 1 and 3 of the DXCC country criteria. An application for separate DXCC status is pending, and a DXCC vote is expected momentarily.

ZS9Z/ZS1 operators N7NG, OH2BH, OH2RF and ZS6BCR arrived on the coast of Namibia November 27 and made their first attempt to land on Seal Island that same day. The only possible landing site was battered by heavy seas, so it was impossible to move a large quantity of DXpedition gear. Some operators were put ashore, and they found traces of the original German DXpedition to that island.

On Wednesday, November 28, a more successful attempt was made to land on a neighboring rock called Penguin Island. The weather was excellent and the landing area seemed much more favorable, but it was situated on the wrong side of the rock, which blocked an unobstructed shot at the northern sector, and blocked all of the U.S. and Japan on long path.

To avoid any unpleasant surprises, the group brought more than one mile of RG8/U coax to reach the highest tip of the island, and to have the beams out in the clear. They spent one whole day under intense sun conditions, carrying and mounting a 40-foot Rohn with a Hy-Gain TH5 on top. Another tower supported a Hy-Gain 103BA, while Butternut verticals were used for the lower bands. We sincerely hope that the ZS9Z/ZS1 signals proved worthy of that effort.

Some 33,200 QSOs were made during the six days of operating. Two ICOM IC-735s with amplifiers were supplied with 6 kW of generator power. The first days and the weekend were spent on selected bands to provide everyone with at least one contact. Some RTTY and WARC band operating was launched for the first time from Penguin, and a brief showing was made on 80/160 toward the very end.

Facilities on the island were highly limited, and the operating was done from the remains of a guano community that had existed there a long time ago. The birds were relatively agressive, and there were nests everywhere. The conditions were next to hazardous, and the smell was horrible. All the nests in the vicinity of the operating site and on the way to the towers were protected by markings.

Despite many rumors to the contrary, landing permissions were on hand for both Seal and Penguin Islands. A South African (RSA) delegation from the Department of Nature and Environmental Conservation landed during the operation to make sure that the ecological balance on the island was not disrupted.

The last 20 hours of the operation used Butternut verticals only, and the operation wound up immediately after sunrise on December 6, 1990.

Many logistical phases had to be successfully completed to secure this DXpedition. Derek Moore V51DM played a major role in providing assistance and supplying a master cable to reach the top of the island, and in placing his fleet of air rafts at the disposal of this DXpedition. Thanks are also due to Harold Lund ZS6WB in Pretoria for loaning us the generators, and for coordinating and supporting railway container shipments through South Africa and providing a four-wheel drive vehicle with a trailer for nonstop driving from ZS6 to the coast of Namibia, a 30-hour drive. And, we wish to credit Ian Sutherland ZS9A for offering highly valuable assistance in planning the landing and the setup on Penguin Island. A major local organizing burden was borne by Chris Burger ZS6BCR, one of the operators.

The cost of logistics for an operation of this magnitude was extremely high, but many institutional and private parties have moved in to offset the logistical expenses.

Please note that V51Z (CQ WW CW contest only) and the Penguin Island DXpedition will be QSLed via Martti Laine OH2BH. The rescheduled ZS9Z operation from Walvis Bay (active during mid-December) will QSL via ZS6BCR.

QSL Routes

4M1G	Via YV1CLM
4M3B	Via YV3BKC
4M5T	Via YV5JBI
4M5Y	Via YV5LAS
4N1A	Via YU1FJK
4N4C	Via YU3EZC
4N4W	Via YU4GYZ
4N7M	Via YU7KMN
4N7ZZ	Via YU7FIJ
6FXBCS	Via VE7DP
9M6ET	Via WB2KXA
9M6OO	Via N2OO
9M8ZR	Via WA2HZR
AT0T	Via KE3A
AT0V	Via VU2CVP
CE0ZZZ	Box 13312, Santiago, Chile
CQ5ASM	Via CT1ASM
CT2A	Via CT1BOH
D68GA	New Address: Don Jones, N6ZV, 1605 Avenue O-4, Palmdale, CA 93551
DX1A	Via DU1AU
DX8A	P.O. Box 5616, Iligan City 9200, Philippines
ED3MM	Via EA3BOX
HB0/HB9AON	Via DJ2YE
HG1S	Via HA1KSA
HG1W	Via HA1YA
HG4P	Via HA4ZZ
HG5A	Via HA7RY
I1A	Via I1RBJ
IN0G	Via IK0GPP
IQ3A	Via I3MAU
J43A	Via SV3AQR
J6LRU	Via W8ILC
JT1T	Via JT1KAA
KP2A	Via W3HNK
L4D	Via LU4DCK
LW0DX	Via LU4HH
LX9DD	Via LX1GQ
LZ5A	Via LZ1KGB
LZ5Z	Via LZ1KDP
LZ6W	Via LZ2KSQ
LZ6Z	Via LZ2HKM
LZ9A	Via LZ2KTS
OD5IM	Via F6CYU with 4 IRCs
OD5YU	Via KC4DWI
OR4EEC	Via ON bureau
OT5LO	Via ON5LO
P40A	Via N1GL
PJ2/OH9RP	Via OH9RP
SN3A	Via SP3GEM
SN6O	Via SP6PAZ
T30X	Via DJ6SI
T32Z	Via N7YL
T33R	Via OH3GZ
T33T	Via OH3GZ
T33WV	Via DK2WV
T33X	Via DJ6SI
V2/G6QQ	Via G6QQ
V85OM	Via N2OO
WN4KKN/ZP5	Via AA5BT
YJ0ARW	Via ZL1AMO
YP0A	Via YO9HP
YT2B	Via YU2KDE
YT2R	Via YU2CRT
YT3M	Via YU3DJK
YT3T	Via YU3EIJ
YT4T	Via YU4ECJ
YT5R	Via YU5GBC
YT7A	Via YU7GMN
YT90A	Via YT3AA
YW3A	Via YV3AZC
YW5Y	Via YV5LAJ
YW6W	Via YV6CAX
YZ4Z	Via YU4EXA
YZ7V	Via YU7ECD

QSL Notes

ZL1BQD still has logs open for the following operations:

FK0RR	New Caledonia	September 1981
VK9NR	Norfolk Island	January 1982
3D2RJ	Fiji	September 1982
ZL8BQD	Kermadec Islands	March 1984
ZL1BQD/KH6	Hawaii	October 1985
5W1FP	Western Samoa	March 1986
ZK3RR	Tolelau Island	March 1986
ZL9BQD	Auckland Islands	February 1988
3D2RJ	Rotuma	August 1989

And, he is the manager for ZL0AJW/8 and 3D2AH (Rotuma). QSL to Roly Runciman ZL1BQD, 36 Cardiff Rd., Paluranga, Auckland 1706, New Zealand.

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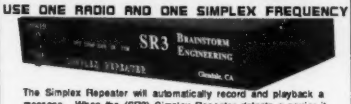

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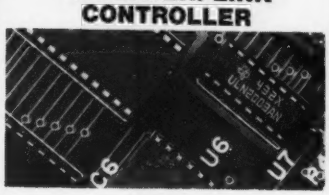

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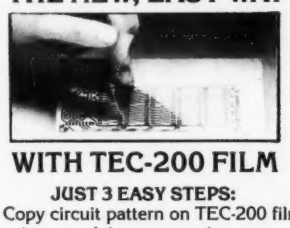

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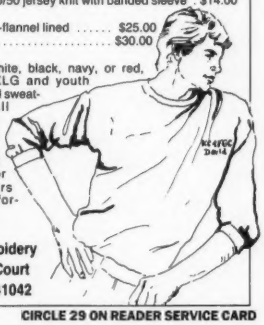

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Notes from FN42

Several hams have heeded my plea for hambassadors. I guess they just couldn't pass up the offer of a FREE airmail subscription to 73 Amateur Radio Today. *Offering to become hambassadors were Charles Martin AB4Y, on his way to Saudi Arabia for a year; Mike Lazaroff KB3RG/CU3LF, presently on Terceira Island in the Azores; and Robert Wright XQ6EK, a resident of Chile and radio officer on merchant vessels.*

Another hambassador has been added through the efforts of Bill Brown WB8ELK, our managing editor. Hans van de Groenendaal ZS6AKV will step in to keep us informed of happenings in South Africa. Many of you know Hans through his AMSAT efforts and ham ballooning. One of his articles, "Give a Lift to Your ARC," on Balloon Carrying Amateur Radio, or BACAR, was in the March 1990 issue of 73.

I am sure much has been happening in these countries during the past several years. No one has reported from Saudi Arabia since December 1984, from Chile since May 1988, and from Portugal/Azores since July 1988.— Arnie, N1BAC

Roundup

Greece *A letter from the Greek Mountaineers' Club: 5; Aristotelous Square, Thessaloniki 54624, Greece.* This report describes the radio activities of members of the Greek Mountaineers' Club in the Caucasus region last August. The club operates a licensed VHF rescue network (slightly above the 2m amateur band). On two occasions in 1990, the network proved invaluable in initiating and coordinating mountain rescues by helicopter. Many members also engage extensively in mountain-topping amateur radio activities.

The club conducts ongoing tests to explore and develop the network's capabilities. In the course of these tests, radio amateurs SV2AHT, SV2AHJ, and SV2BBQ took along HF and VHF equipment on a mountaineering expedition to the Caucasus region (in the U.S.S.R.) last August. Two meter handhelds by Yaesu and ICOM provided communications during the ascent of Mt. Elbruz (5,642 meters). No amateur contacts were made, as amateur activity in the 2m band was conspicuous by its absence.

SV2AHT made a number of interesting QSOs in the 20m band in the period of August 21 to August 30, 1990. The station was located at 4,200 meters above sea level. Temperatures reached −10°C. *[Was that the high or low, I wonder? Brrrrrrr!—Arnie]* Stations contacted include VK, 5B, SV, N, UA, KA, DJ, and I.

The transceiver was a GCR-250 all-band, all-mode rig manufactured in Greece. Running at low power (8–10 watts out), it displayed fairly low power consumption. The NiCd batteries powering the unit were recharged by portable solar cells. The antenna was a 20m dipole. 73s from Vassilis Toulis, SV2BBQ. *[Vassilis sent along some beautiful photos and they will be presented in this and succeeding issues.—Arnie]*

Japan *From the JARL News.* On November 14, 1990, 55 members of the 32nd Japanese Antarctic Research Expedition left Tokyo on board the icebreaker *Shirase* for a two-year tour of observation duty in the polar regions. Mr. Hara JA1AN, president of JARL, along with other JARL members, met to see them off.

A week earlier, Mr. Toyoshi Arisawa JA4EDV, together with three other members, all in charge of communication on the expedition, attended lectures on amateur satellite operation delivered at the Technical Laboratory of JARL. Needless to say, acquiring such knowledge will prove a must in their attempts to communicate via satellite from amateur radio stations 8J1RL in Showa Base and 8J1RM in Asuka Observation Base. Eleven members of the team hold amateur radio licenses. They will be eager to receive news, and anticipate both stations to be on the air from 0930 to 1030 UTC, mainly on 7, 14, and 21 MHz. *[A full listing of JARL Beacons was listed in this issue of* The JARL News, *but it's too lengthy to present here. Look on the 73BBS under 73INTL SIG, "JARL Beacons."]*

BRAZIL

Carlos Vianna Carneiro PY1CC
Afonso Pena 49/701
20270 Rio de Janeiro
Brazil

Best wishes to all in this coming 1991. May there be Peace and Fraternity in this world we live in.

We are having a kind of QRP boom in Brazil, as only CW QRP equipment is being produced the artisan way in São Paulo. The equipment provides 5 watts output and is priced at $180 to $200, thus allowing beginners to start CW operations reasonably cheap. We've heard about a new QRP rig from the Japanese, with crystal filters and plenty of other items "for JUST $1,300"!!

Coming back to home-brew QRP equipment, I am looking for a linear amplifier schematic that will bring 3–4 watts up to 30–40 watts. If anyone has a good one please send a copy to me directly or to Arnie at *73* and he will send it to me.

I think many Brazilian hams are now discovering the Islands On The Air (IOTA) award program, and as we have islands by the hundreds along the coast, we are trying to develop DXpeditions by interested groups to "shake up" the sleepy amateurs all over.

As my part of this shake-up, I am presenting two DXpeditions, one to Trindade Island and the other to São João Island. Best wishes for the coming year. *[The trip to Trindade Island will be presented later.—Arnie]*

São João Island, IOTA S.A. 41. Raising the international interest for its program, the IOTA is offering a new potential to radio amateur development, and especially for the adventures of DXpeditions, like this one to São João Island. That old feeling for adventure once again "pushed" Ronaldo PS7AB and Tino PT7AA toward a different and exciting DXpedition to São João Island, officially known as Maiaiu Island, some 30 miles off the Brazilian coast north of Maranhão state.

This island is part of an archipelago with tens of smaller islands, some of them inhabited by fishermen and their families. On São João Island is a 35-meter-high lighthouse erected by the Brazilian Navy.

Leaving Natal City by bus, they took some hundred kilos of equipment over extremely damaged roads and prehistoric wooden bridges for about 2,200 kilometers. On reaching Apica-Açu village north of Maranhão state, they boarded a small fisherman's boat for a 13-hour trip, four of the hours on open sea. This was the most unexpected "rally" for Ronaldo PS7AB, not used to such adventures.

For Tino PT7AA things ran differently, coming straight from São Luiz City, the capital of Maranhão, by boat, also with high seas during the 48-hour trip, with 10-meter-high waves during the 160 mile travel, praying all the time for the small boat's safety!

And then, São João Island, a real paradise, safe from any ecological damage, splendid and rich tropical flora, endless cocoa tree groves, lovely birds of all colors, as the Guará in its glorious red color, and a sea of limpid waters, a tepid habitat for an enormous variety of fish, shrimp and crustaceans, clear sand and sandy hills as beaches, a real dream.

The island is located at 01°17'S–44°54'W, 30 miles off the coast of Maranhão, fishermen's boats the only way to shuttle over.

With the Navy "permit" to share part of the lighthouse, we had rooms and bathrooms, and power. We had our "shack" for the Kenwood TS-430, ICOM IC-725, AT-130 and AT-250 couplers, a Brazilian Spectrum electronic keyer, Shure 444D microphone, and two vertical Electril multiband antennas, one of them up 35 meters on top of the lighthouse.

Tino operated as ZX8CW (CW mode) and Ronaldo as ZX8DX (SSB mode) from 5 to 13 October 1990. They made 3,037 phone QSOs in 104 countries, and Tino made 1799 CW QSOs in 67 countries. Using Vee antennas, they got very good results from America and Europe, and not so good for Asia and Africa.

São João Island is 7½ km long and about 1½ km wide, with the lighthouse on one end, and a fisherman's village on the other, with a beach called, "Bate o Vento" (wind blowing). The island has a normal temperature, about 28°C and almost no rain.

I asked Tino by radio after the expedition was over, "So Tino, was it all worthwhile?" The answer came back straight and sure, "Of course, Carl! It was marvelous, no matter what problems, and we will never forget the fantastic scenery of São João Island."

Special thanks from the DXpedition members to the Navy people living there, four families; and a very, very special 73 to Vanderley Valente, a Navy corporal for 10 years in charge of the lighthouse, for their friendly sympathy.

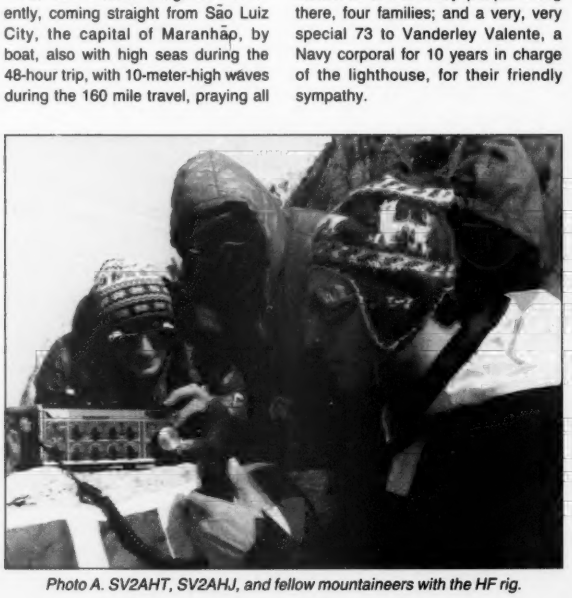

Photo A. SV2AHT, SV2AHJ, and fellow mountaineers with the HF rig.

CHILE

Robert M. Wright XQ6EK
Casilla 1259
Osorno
Chile
South America

Hello to all amateur radio operators. I am very glad to become the hambassador for Chile. Let me tell you something about myself.

I am a radio officer on board merchant vessels, holding licenses as such in the countries of Great Britain, Panama, Liberia, and the United States. I have five years of seatime and have worked many years as a radio operator at coast stations, such as WPD and WKM.

I hold nine amateur radio licenses, Canada Superior Class VE2OST, U.S.A. Extra N4VBG, Diego Garcia VQ9MW, Chile Superior Class XQ6EK (XQ is a First Class prefix in Chile, only 100 in the entire country), ex-DJØGB in Germany, and many others. I am 26 years old, 11 years an amateur operator, married (my XYL's callsigns are CE6POP and KC4LQD), and live on a dairy farm about 1,000 kilometers south of Santiago when not working my eight months a year at sea.

At my home QTH, I work an ICOM IC-735, amplifier of 500 watts or so, and a Cushcraft R-5 ground-mounted antenna. I also have a 100-foot tower where I will soon install a yagi or quad beam antenna. I am very active on 2 meters as well. I speak Spanish, German, and English.

I hope I have a chance to talk to many of you in the years to come, and I ask that all amateurs of Chile send me information of happenings in their areas. 73 to all.

LITHUANIA

Jonas Paskauskas LY2ZZ
PO Box 71
Siauliai 235400
Lithuania

The Lithuanian Amateur Radio Conference will be held in Vilnius, Lithuania during the first week of June 1991. The conference will last approximately 7–10 days. It will start in the capital, Vilnius, then move on to Kaunas, Panevezys, Siauliai, and Palanga, a resort town on the Baltic Sea.

To date, 26 amateurs from outside Lithuania are planning to attend: 15 from the U.S.A., three from Canada, four from Germany, two from England, and two from Scotland.

If you wish more information, or wish to attend, please contact me at the above address with your requests. I'm looking forward to the conference and to meeting some of the hams that I have talked to on the air. *[The conference scheduled for last June had to be canceled due to the political climate at that time. We hope nothing will prevent the conference this year.—Arnie]*

Lithuanian yachtsmen are in the process of outfitting a sailboat for a trip around the world, to last approximately 18 months. The purpose of the trip is to show the flag and visit major Lithuanian colonies. The crew of 18 will include a licensed radio amateur with a special event callsign. More on this later, as more information becomes available.

NEW ZEALAND

Des Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

Now that 1990 is over, the NZART year can be viewed in retrospect.

Late 1989 saw the beginning of NZART managing the entire administration of amateur examinations on behalf of the New Zealand Frequency Service (NZFS) of the Department of Commerce. Applications are processed by NZART HQ, the examination centres set, the preparation and distribution of the examination papers, and the arranging with the branches for approved members to supervise and conduct the exams. When the exam is completed, the papers are returned to NZART HQ for marking, and the candidates are advised of the results directly from NZART HQ within several weeks of the exam date. Before, when the NZFS supervised and conducted the exams, it took two to three months.

The NZ Frequency Service is also favourably considering the transferance to NZART of the administration and testing of candidates for Morse code. We anticipate this will take place before March 1991.

New school radio clubs have formed during the year. The increased interest in amateur radio has become evident by the many school clubs heard on the air during lunch breaks, and many schools are now featuring amateur radio in their Open Days.

From 1 November 1990, the NZFS approved the use of 2 meters (144–148 MHz) by Novice operators. The regulatory body refused the initial request from NZART in March, but after further submissions, agreed. So now, if there are reciprocal rights between NZ (ZL) and your country, as a visiting Novice operator, you will be able to operate on the 2m band.

This year ZL amateurs are participating in an IARU International Monitoring Service. From 1 March 1990 through 24 February 1991, amateurs and nonamateurs (listeners) are monitoring set frequencies outside the ham bands 24 hours each day, to identify the unused or rarely used parts of the radio spectrum adjacent to the amateur bands.

NZART Conference, 1991

The 1991 NZART Conference will be held at Marton, NZ. The "Martian Conference" venue will be an agricultural training facility, called Flock House, near Marton. The venue has graded accommodation facilities as follows: Executive—$81.70 per day; Business, $57.15 per day; and Thrifty, $30.85 per day. If you prefer to camp, it's $3.00 for adults and $1.62 for children per day.

If any overseas amateurs are visiting during May/June, the conference dates are 31 May through 3 June, a full weekend of amateur radio activities centered around the annual meeting of NZART, and plenty of social activities as well. The accommodation and conference venues are all within the complex at Flock House; therefore, you can walk from place to place with no worries about transport.

Recreational facilities are good—an indoor heated pool, squash courts, tennis courts, and a sports field. If any of my overseas readers are interested, write to me and I will send your letter on to the organizing secretary.

New Bands for ZL Recently, as a result of submissions made on our behalf by the Frequency Management Technical Advisory Group (FMTAG) of NZART, the NZFS made two new bands available to ZL amateurs. The two bands are 165 to 190 kHz (1700m), with a maximum EIRP of 5 watts; and 922 to 927 MHz (32cm), with a maximum EIRP of 25 watts. FMTAG is presently formulating possible uses for these two new bands, maybe in some specialty communications areas. The bands are available on application to the holders of the ZL General licence.

Other items: The new QSL address for ZL is: B.E. Stewart ZL2RR, PO Box 857, Wanganui, New Zealand.

Terry ZL3QL, NZART President, is on temporary posting to Los Angeles with Air New Zealand as a 747 captain. He should be on the air from L.A. during his time there.

PORTUGAL/AZORES

Mike Lazaroff KB3RG/CU3LF
PCS Box 1687
APO New York 09406

I'm a 15-year veteran of the United States Air Force and currently stationed on Terceira Island in the Azores (CU3-land). I would love to write reports on the Azores and ham radio.

Operating from here is a ball—the bands are open all the time, and the CU call seems to add 15 to 20 dB to your signal! I'm active on all bands, 160 to 10m on CW, SSB, packet, and RTTY.

[For those amateurs in Portugal, feel free to send your ham information to Mike for inclusion in the column, or you can send the info directly to me. —Arnie]

Number 25 on your Feedback card

UPDATES

Jan. '91 "Circuits"

See the schematic for KB4ZGC's regulated voltage distribution box on page 58 of the above issue. Note that the inputs to regulators 7808 and 7806 should be joined to the line from the output of LM317, in the same manner that regulators 7805 and 7809 are.

Jan. '91 "Frequency Standard"

See the above issue for the article, "High Precision Frequency Standard," by Johnson, on page 9.

John H. Davis, Chief Engineer WJSP-TV/FM: "It is no longer possible to rely on a TV station's sync to atomic precision, even during network programs, except in a relatively few cases. The development of affordable digital frame synchronizers in the past decade has changed things. Nearly all stations use one or more of them.

"The frame synchronizer digitizes incoming video, then plays it back in step with the station's *local* sync generator, which is usually *crystal controlled.* There are a few exceptions, but well over 80% of stations are referenced to a local crystal 100% of the time. Mr. Johnson's circuit seems solidly designed, but be very sure of your reference!"

Bradford E. Scott WD9HDZ, engineer at WCET: "A network signal processed through a frame synchronizer no longer maintains the rubidium-standard accuracy, but instead exhibits the characteristics of the local station's sync generator, which usually uses a quartz crystal. This local oscillator is adjustable, and must be periodically calibrated. The FCC requires that broadcast TV stations keep their color subcarriers accurate to within plus or minus 10 Hz, or within 2.79 times 10 to the minus 6th percent. Thus, a calibration reading taken from a station using frame synchronizers may be inaccurate by that amount."

Paul D. Roehm KB9CLA, works for WRTV: "In all but the smallest TV markets, incoming network video is run through a frame synchronizer. Because of this, the accuracy of the 1 MHz signal generated by the PLL would have the accuracy of the sync generator at your local television station.

"All network programming is sent to your local station by satellite. All satellites, even geostationary ones, have Dopper shift. Though small, about 1 Hz, the shift may cause short-term errors in your frequency standard. Where Mr. Johnson lives, in Los Angeles, the local TV signal is coming from the same source as the network, rather than from the satellite. If you live in Los Angeles or New York, the circuit will work for you.

"All is not lost, however. Some stations, including the one I work for, are locked to the WWV 60 kHz signal as a condition of their license. If you can change the system to lock to their visual carriers, then you are home free." 73

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SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check /HAMFESTS on our BBS (603–525–4438) for listings that were too late to get into publication.

MARCH 2

ABSECON, NJ The Shore Points ARC will hold its 9th annual hamfest, "Springfest '91", at Holy Spirit High School. Doors open at 9 AM. Set-up at 7 AM. Reservations will be accepted for tables in the heated indoor selling area. Outdoor tailgating space available, weather permitting. Limited AC. Sellers: $5 per 8' table; buyers: $4. Talk-in on 146.385/.985. Write to: *SPARC, P.O. Box 142, Absecon NJ 08201.*

ALAMOGORDO, NM The Alamogordo ARC will hold VE Testing at the Alamogordo Mid High School, South entrance, beginning at 12:00 noon. Contact *Marilyn Redman, Public Information Officer, Alamogordo ARC, P.O. Box 1191, Alamogordo NM 88310.*

CAVE CITY, KY The Mammoth Cave ARC will sponsor their 15th annual Glasgow Swapfest at the Cave City Convention Center, beginning at 8 AM Central time. Admission is $4 per person, tables $5 each. VE exams, walk-ins welcome. Talk-in on 146.34/.94. Contact *N4HCO, 1379 Whites Chapel Rd., Glasgow KY 42141.*

MARCH 3

YORK, PA The Fourth Annual York Springfest (Ham & Computer) will be held at the Dover Fire Hall starting at 8 AM. Admission $4, unlicensed spouse and under 12 free. Tailgating $1. Inside tables $10. VE Exams. Talk-in on 146.37/.97 and 147.93/.33. Contact *York Springfest, P.O. Box 316, New Freedom PA 17349-0316. (301) 239–3878.*

ROSTRAVER TOWNSHIP, PA The Two Rivers ARC of Mc Keesport will hold its 18th annual Swap and Shop at the Rostraver Volunteer Fire Hall from 8 AM–3 PM. Admission is $1. Contact *Mr. Michael Kowalcheck KV3L (412) 751–9657.* Directions will be available on the WA3PBD repeater, 146.13/.73.

MARCH 8

ST LOUIS CITY, MO The Jefferson Barracks ARC will hold their 31st annual Amateur Radio Auction at the Concordia Turner's Hall. Doors open at 5 PM and the Auction starts at 7:30 PM. Talk-in on 144.61/145.21 and 146.34/.94 repeaters after 5 PM. Contact *Carl H. Hohenberger WB0BPZ, 5266 Parker Ave., St. Louis MO 63139-1340. (314) 351–7084.*

MARCH 9

TULLAHOMA, TN The Middle Tennessee ARS will hold an Old-Fashioned Swapfest at the Tullahoma TN Airport, Hanger #6. Talk-in on 146.10/.70. Contact *Richard Johnson W4SFF, 109 Dogwood, Winchester TN 37398.*

MT. ARLINGTON, NJ West Morris Wireless and Splitrock ARA will sponsor the annual North Jersey Hamfest at the Mt. Arlington Sheraton beginning at 8 AM. Set-up at 6 AM. VE Exams begin at 8:45 AM. Admission $5, XYLs and children free. Tables $15. Talk-in on 146.985/.385 and 223.860/2.260. Mail table registrations to *PO Box 610, Rockaway NJ 07866,* until Feb. 28. Late registration, call *Bill WR2M, (201) 770–0242 till 10 PM,* or *Bernie WB2YOK, (201) 584–4423.*

ROSELLE PARK, NJ The Student Body of Roselle Park High School and the Old Bridge Radio Assn. will host the Roselle Park Family Computer/Ham Festival. Flea Market from 9 AM–4 PM, plenty of tailgate space. Admission $5. Talk-in on 146.520 simplex. Contact *Computer Exposition and HamFest, Roselle Park High School, 185 West Webster Ave., Roselle Park NJ 07204. (201) 241–4450; or BBS, (201) 241–8902 (24hr 300/1200).* Directions: Garden State Parkway Exit 137 to East on Westfield, 3rd light, left on Locus, left after RR underpass.

MARCH 10

BRISTOL, CT The Insurance City Repeater Club will hold its annual Amateur Radio/Computer Flea Market at the Bristol Eastern High School from 9 AM–2 PM. Admission is $3. Six foot tables are $12. Contact *Chuck Motes K1DFS, 22 Woodside Lane, Plainville CT 06062, (203) 747–6377.* VEC Exams by registration only. Contact *Sue Fredrickson WM1B, PO Box 165, Pleasant Valley CT 06013* as early as possible. Talk-in on 146.28/.88.

INDIANAPOLIS,IN The Morgan County Repeater Assoc. will sponsor the Indiana Hamfest at the Indiana State Fairgrounds Pavilion building. Admission is $7 at the door. 8' Flea Market tables (with space), $12 each. No space will be sold without a table. Set-up Sat. Mar. 9 from 3–9 PM and Sun. Mar. 10 from 6–8 AM. Talk-in on 145.25. For reservations, send SASE before Feb. 23 to *Aileen Scales KC9YA, 3142 Market Place, Bloomington IN 47403. (812) 339–4446.*

MARCH 15–17

ORLANDO, FL The 45th annual Orlando HamCation and Computer Show, sponsored by the Orlando ARC, will be held at the Central Florida Fairgrounds. The Exhibitors Area will be located in a 44,000 square foot air conditioned building. Overnight RV parking at reasonable cost. The Host hotel is The Ramada, Orlando Central at 3200 West colonial Drive. FCC Exams on Sunday at the Ramada convention Center. Complimentary continuous bus service from the Ramada to the Fairgrounds. Contact *Dick DiVittorio KB4QKP, General Chaiman 1991, PO Box 547811, Orlando FL 32854-7811.*

MARCH 16

SCOTTSDALE, AZ The ARCA Spring Hamfest, hosted by the Scottsdale ARC, will be held from 7 AM–4 PM at the Scottsdale Community College. Admission is $2 per car. Swap space $5. Talk-in on 147.18/.78 and ZIA Link. Contact *Allen Sklar AA7BJ, PO Box 10878, Scottsdale AZ 85271-0878* or *(602) 491-0802.*

FLEMINGTON, NJ The Flemington Hamfest, sponsored by the Cherryville Repeater Association II Inc., will be held at the Hunterdon Central Regional High School Fieldhouse from 8 AM–2 PM. Wheelchair accessible. Free parking. Tailgating. VE Exams. Talk-in on 147.975/.375 MHz duplex and 146.520 MHz simplex. Contact *Marty Grozinski NS2K, c/o Cherryville Repeater Assoc. II Inc., PO Box 308, Quakertown NJ 08868. (908) 806–6944* or *(908) 788–4080.*

MARSHALL, MI The Michigan Crossroads Hamfest, sponsored by the Southern Michigan ARS and the Marshall High Photo Electronics Club, will be held at the Marshall High school from 8 AM–3 PM. Set-up at 6 AM. Tickets $2 in advance, $3 at the door. Free parking. Table Reservations: 75c per foot (min. 4 feet) reserved until 8 AM. Send SASE to *SMARS, PO Box 934, Battle Creek MI 49016,* or call *Wes Chaney N8BDM, (616) 979–3433.* License Exams start at 9:30 AM. Pre-registration requested. Include Form 610, SASE and $4.95. Make check or M.O. payable to *ARRL VEC* and send to *Barry Polack, 330 East Berry Rd., Rives Jct. MI 49277.* Exam charge subject to change.

HUDSON, NH The Interstate Repeater Soc. will hold its annual Flea Market at the Lions Club Hall from 9 AM–3 PM. Set-up at 8 AM. Admission $2. Talk-in on 146.85, 224.46 and 449.625 IRS repeaters. Contact *Wayne Canino KA1MKH, (603) 895–9033.*

MARCH 16–17

FORT WALTON BEACH, FL The Playground ARC will hold their 21st annual North Florida Ham/Swapfest at the Shrine Fairgrounds. Doors open at 8 AM both days. Free Parking. RV parking for $10 per night. Admission $3 in advance, $4 at the door. Swap tables $10 for one day, $15 for both days. Talk-in on the 146.19/.79 club repeater. Contact *Playground ARC, PO Box 873, Ft. Walton Beach FL 32549.*

MARCH 17

MAUMEE, OH The Toledo Mobile Radio Assn. will hold a Hamfest at the Lucas County Recreation Center from 8 AM–5 PM. Advance admission is $4, $5 at the door. Talk-in on 147.27 and 442.85 repeaters. Contact *Bob Hanna K8ADK, 2154 Circular Drive, Toledo OH 43614.*

BRAINTREE, MA The South Shore ARC will hold its annual Flea Market at the Viking Club from 10:30 AM–3 PM. Free parking. Set-up at 9 AM. Admission $1. 8' tables for $10 (which includes one free admission per table), if paid for in advance before Mar. 13. Write to *Hal Jones WB1ABM, 48 Saning Rd., N. Weymouth MA 02191,* or call *(617) 335–5777,* evenings. Make checks payable to the South Shore Amateur Radio Club. Non-reserved tables are $12.

STERLING, IL The Sterling-Rock Falls ARS 31st annual Hamfest will be held at the Sterling High School Field House from 7:30 AM. Set-up Sat. Mar. 16 from 6–9 PM, and on Sun. Mar. 17 at 6:30 AM. Advance tickets $3, $4 at the door. Tables $5 including electricity. Bring your own cord. Talk-in on 146.25/.85 W9MEP repeater. Contact *Sue Peters, Sterling-Rock Falls ARS, PO Box 521, Sterling IL 61081,* or call AC at *(815) 625–9262.*

MARCH 21–23

WASHINGTON, DC A 3-day hands-on Personal Computer Interfacing workshop will be held at the Virginia Tech campus. Contact *Dr. Roy Jones, (703) 231–5242 or (703) 231–6473.*

MARCH 23

UPPER SADDLE RIVER, NJ A Ham Radio Flea Market, sponsored by the Chestnut Ridge Radio Club, will be held at the Saddle River Reformed Church Education Building. Tailgating $7. Tables $10. Donation $2. Contact *Jack Meagher W2EHD, (201) 768–8360.*

ELIZABETHTOWN, KY The Lincoln Trail ARC will hold its 11th annual Hamfest at the Pritchard Community Center. Walk-in VEC Exams (fee $5.25) begin at 9 AM fee $5.25. Show original license and a copy of same. Free parking. Security provided. Set-up starts at 6 PM the night before. Advance tickets $4, $5 at the door. Vendor spaces are $5 each (includes one table and one chair). Talk-in on 146.52 and 146.38/.98. For reservations contact *Whitey Hensley WD4GDA, PO Box 342, Vine Grove KY 40175. (502) 877–2234.* Send check or money order and a SASE. For info call *Chuck Strain AA4ZD, (502) 351–1715.*

MARCH 24

TRENTON, NJ The Delaware Valley Radio Assn. will sponsor Hamcomp '91 at the New Jersey National Guard 112th Field Artillery Armory, Lawrence Township, from 8 AM–2 PM. Free parking. Wheelchair accessible. Advance tickets $3, $5 at the door. Indoor selling spaces are $15 (wall space) or $10. Outdoor spaces are $8. Sellers must provide their own tables. Set-up at 6 AM. Talk-in on 146.07/.67. Contact *Hamcomp '91 c/o KB2ZY, 33 Bowne Station Road, Stockton NJ 08559.* Please SASE.

MADISON, OH The Lake County ARA will hold their 13th annual LCARA Radio/Computer/Electronic Hamfest at Madison High School from 8 AM–3 PM. Admission is $4. Indoor fox hunt will be at 1 PM on 2 meters. VE Exams begin at 8:15 AM and cost $5.25. Tables: $5/6', $6.50/8'. Talk-in on 147.81/.21 and 222.90/224.50 (PL 141.3). Contact *Roxanne, Lake County Hamfest, 5777 Fenwood Ct., Mentor-on-the-Lake OH 44060.* Phone *(216) 257–2036* from 6–9 PM weekdays or 10 AM–4PM weekends, or *(216) 352–6756* 10 AM–4 PM weekdays.

MARCH 30

TEXARKANA, TX The Four States ARC will sponsor its second annual Swap Meet at the Four States Fairgrounds at Loop 245 and I-30, beginning at 8 AM. Admission $1. Tailgate party with cover available if WX is bad. VE Exams at 1 PM. Talk-in on 146.62 –600. Contact *Travis Bailey K5AVH at (903) 792–2080.*

SPECIAL EVENT STATIONS

MARCH 2–3

OPP, AL The Covington ARS will operate Station KZ4S from 1400Z Mar. 2–0200Z Mar. 3, to commemorate the 32nd annual Opp Jaycees Rattlesnake Rodeo. Frequencies: 25 kHz up from the General 80, 40, 20 and 15 bands and approximately 28.385 on Novice 10 meter band. For commemorative QSL and brochure, send QSL card and business size SASE to *C.A.R.S., c/o Kay B. Ezell N4VJI, PO Box 244, Opp AL 36467.*

MARCH 8–10

SWEETWATER, TX The Nolan County ARC will operate Station WR5B from 1500Z–2400Z Mar. 8–10, during the world's largest rattlesnake round-up. Frequencies: 20 and 40 meter General phone bands plus 10 meter Novice. For certificate send QSL and large SASE to *WR5B, PO Box 825, Sweetwater TX 79556.*

MARCH 16–17

ST. PATRICK, OH The Farout ARC of Dayton will operate Station WB8SMC/8 from 1700Z Mar. 16–1700Z Mar. 17. Frequencies: Lower halves of: 80, 40, 15, 10 meter Novice CW and 10 meter Novice phone; 80, 40, 20, 15 meter General phone. Send a business size SASE to *Farout ARC, PO Box 9181, Dayton OH 45409-9181.*

PISCATAWAY, NJ The Piscataway ARC will commemorate the historic Voice of America relay station, WBOU, that operated in Piscataway from 1942–1964. PARC members will operate using their own call signs/VOA from 000Z Mar. 16–2400Z Mar. 17, in the lower General portion of 75, 40, 20, and 15 meters, and the Novice 10 meter band. For certificate, send QSL and 9x12 SASE to *PARC, Attn: KB2UV, PO Box 1233, Piscataway NJ 08854.*

MARCH 23–24

The Virginia Beach ARC will operate Station WA4TGF from 1400Z Mar. 23–2000Z Mar. 24, to commemorate the 100th anniversary of the arrival of the Norwegian Lady to our shores. Frequencies: 3.875, 7.275, 14.275, 21.275 and 28.363 MHz. A certificate will be available to all amateurs contacted. Send QSL and SASE to *VBARC, PO Box 62003, Virginia Beach VA 23462.*

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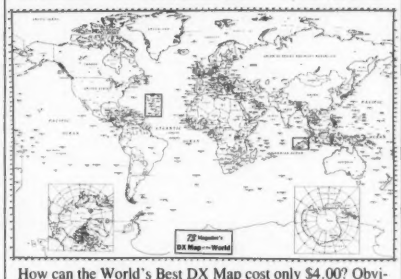

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RANDOM OUTPUT

David Cassidy N1GPH

14.313 MHz

I happened to scan by 14.313 MHz the other day, and I couldn't believe what I heard. The same people who were demonstrating their ignorance over two years ago are STILL on that same frequency . . . arguing the same stupid points . . . being QRMed by the same idiots . . . blah blah blah . . . yak yak yak . . . yawn, yawn.

I have managed to keep my nose out of this little ego battle, figuring that as soon as the participants got bored they would move on to other pursuits befitting their intelligence—like finger painting. Sure, I've mentioned in passing how dumb the whole thing is, but I haven't really addressed the issue directly. The thing that has bothered me the most about the whole ridiculous mess is that it takes up a good chunk of the 20m phone band, which keeps the rest of us from using those frequencies for more productive and enjoyable purposes. I also get a bit angry every time I remind myself that this demonstration of idiocy on the part of American amateurs is being monitored by people all over the world. Some of those foreign listeners will remember what they've heard from the U.S. hams when it comes time to ask for favors at the next WARC. I have also spent a little time considering the example these brainless wonders are setting for newcomers or potential hams.

I went so far as talking to one of the participants a few months ago. I wanted to see for myself if this guy is as big a fool as he appears to be. Yup . . . he is.

I've sought out and listened to the so-called bulletins. Total tripe.

I've even spent several hours just monitoring that portion of 20m, where most of this crap is displayed. I've listened to all sides. I've heard hour after hour of non-identified, intentional QRM.

I've heard virtually everyone who considers himself involved in this mess and what they have to say.

Here's what I've discovered . . .

What we have here, ladies and gentlemen, is a small group of very lonely people. The biggest thing in their life—THE BIGGEST—is the small bit of attention they are able to capture by being pompous and boring on 14.313 MHz. These peoples' lives are so utterly devoid of anything even remotely worthwhile, they have resorted to the only thing they know to justify their existence. They have created a situation, and placed themselves at the focus of it, for no other purpose than to give themselves a reason to get out of bed in the morning. Instead of working constructively and through proper channels to correct what they see as a problem on the amateur bands, these self-appointed keepers of the radio truth have personalized their disagreements. They're not interested in solving problems. Their only motivation is ego gratification. These are true outsiders, folks. The kind of geeks that even the nerds won't associate with. It's funny how important something can become, when the rest of your life is so unimportant.

Try to look at this situation as if you had just come across it today. What would your reaction be? I have explained the conflict to several people who were totally unaware of the whole thing. Every single person had the same response: "Aren't there more important things in the world to spend time and energy on?" All of my non-ham friends who have asked for an explanation of the utter foolishness they hear coming out of my speaker have simply laughed. They're not just laughing at those heard on the radio, they're laughing at the entire amateur radio community for letting such a stupid situation take up so much time, thought and energy. They're laughing at you and me, friend. I can't say that I blame them.

So . . . what's the solution? True to form, the ARRL's response was something like, "We're not involved. It's not our problem." So much for the self-appointed voice of American amateur radio.

The FCC, trying to allow us to fulfill our promise of being "self-policing," has asked those involved to work out their differences. Since those involved have no interest in working out their differences, this has had no effect. Remember, these bozos are getting a barrelful of self-importance out of this. They have actually convinced themselves that what they think is important—enough to cause the inconvenience of thousands of amateur radio operators around the world. Even though the FCC has warned us that if they have to step in to solve the problem they will do so by a swift and privilege-revoking rule change, all the participants can do is continue to bother the FCC with their petty grievances. In frustration, the FCC has stepped up their monitoring and started to levy some stiff monetary penalties (though I haven't heard of anyone who has had his license revoked). The operators who have received fines are wearing them like a badge of honor, further proving their utter stupidity.

One thing that we all can do is make sure we are not providing an audience for these clowns. (This is why you will notice that I haven't mentioned anyone's name or callsign. I know who they are, but I simply refuse to feed their egos by printing their names or callsigns.) If you are monitoring the frequencies, you're part of the problem. If you're monitoring the frequencies AND throwing in an unidentified comment every now and then, you are causing intentional interference.

If you've spent any time around children you know that they will do almost anything, including misbehave, to get an adult's attention. Sometimes the best thing an adult can do when a child is misbehaving is leave the room until the child discovers that his bad behavior will not be rewarded by the attention he craves.

That's what we have here. We have a small group of children who are displaying their desperate need for attention. If we continue to give it to them, we are just reinforcing their behavior. If we all could just leave them alone, they would eventually discover that nobody's listening. Nobody cares. The adults have left the room. 73

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

Almost Excellent

You may expect the usual conditions that prevail around the equinoxes when the ionosphere recovers from its winter doldrums and becomes active again for HF DXing. Since we are slightly past the peak of sunspot Cycle 22 and beginning the slow decline in solar activity, conditions will be excellent. However, they might not be quite as good as conditions during this month in 1989 and 1990. That is, solar flux may be down a bit compared to those two years, and there are likely to be more fair (F) than good (G) DX conditions (see the calendar below).

You can always determine when to operate under the best possible conditions by using three sources of information: the daily propagation forecast chart, the band-time-direction chart, and WWV at 18 minutes after each hour. With these sources, you can pick the best possible times to work that DX you are looking for.

In general, the first two weeks are expected to have better conditions than the last two weeks. But, as usual, there will be occasional good (G), fair (F), and poor (P) days intermixed.

A good (G) day will show low planetary "A" indexes (below 10 or so) when the magnetic field is quiet, and a relatively high solar flux of, say, 175 or more. Increasing magnetic "A" indexes and declining solar flux will mark the fair (F) or poor (P) days for you. One advantage of these days and nights of equal length is the opportunity for excellent gray-line propagation along the paths of dawn and dusk around the world. Use these times to your best advantage. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	—	20	—	—	—	20	20	—	—	15	10/15
ARGENTINA	15	15/20	20	40	40	—	—	10	—	—	10/15	10/15
AUSTRALIA	10/15	20	20	20	20	40	20/40	20	—	—	—	10/15
CANAL ZONE	15	20/40	20/40	20/40	40	15	15	10	10	10	20	10
ENGLAND	20	40	40/80	40/80	40	—	—	15*	10	15	15	20
HAWAII	10/15	15	20	20	20/40	20/40	20	20	—	—	—	10/15
INDIA	20	20	—	—	—	—	—	15	—	—	—	—
JAPAN	10	—	20	—	—	—	20	20	—	—	15	10/15
MEXICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
PHILIPPINES	15	—	20	20	—	—	20	10/15	10	—	—	15
PUERTO RICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
SOUTH AFRICA	20/40	40	20	20	—	—	—	—	10	10	15	15
U.S.S.R.	40	40/80	20	20	—	—	—	10/15	10/15	—	20	20
WEST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	10/15	10/15	20

CENTRAL UNITED STATES TO:

ALASKA	10/15	15	20	20	20	—	20*	20*	—	—	—	10/15
ARGENTINA	15	15	20/40	20/40	20	—	—	10	—	—	10	10/15
AUSTRALIA	10/15	15	15	—	20	20/40	40	20*	—	—	15*	10
CANAL ZONE	15/20	15/20	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
ENGLAND	40*	40/80	40*	—	—	—	—	—	15*	15*	20	20
HAWAII	15	15	15	20	20	20/40	40	20	—	—	10	10
INDIA	15	15/20	—	—	—	—	—	15/20	15	—	—	—
JAPAN	10/15	15	20	20	20	—	20	20*	—	—	—	10/15
MEXICO	15/20	15/20	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
PHILIPPINES	10/15	—	20	20	—	—	—	—	10/15	10/15	—	—
PUERTO RICO	15/20	15/20	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
SOUTH AFRICA	—	—	20	20	—	—	—	—	15	15	15/20	20
U.S.S.R.	—	—	—	—	—	—	—	15	15	15	20	20

WESTERN UNITED STATES TO:

ALASKA	10/15	10/15	15	20	20	20	—	20	20	—	—	15
ARGENTINA	10/15	15	15	20	20	—	—	—	—	—	10	10
AUSTRALIA	10	10/15	15	15	20	20	20	—	20	—	—	—
CANAL ZONE	10	15	15/20	20/40	20/40	*	*	—	—	10	10	10	10
ENGLAND	20	20	—	—	—	—	—	—	—	15	15	15/20	20
HAWAII	10/15	10/15	15	15/20	20/40	20/40	40	—	15	10	—	—
INDIA	—	15	20	—	—	—	—	—	15/20	15	—	—
JAPAN	10/15	10/15	15	20	20	20	—	—	20	—	—	15
MEXICO	10	15	15/40	20/40	20/40	*	*	—	—	10	10	10	10
PHILIPPINES	10	10	—	—	—	—	—	20	15	15/20	—	—
PUERTO RICO	10	15	15/40	20/40	20/40	*	*	—	—	10	10	10	10
SOUTH AFRICA	20	20	—	20	—	—	—	—	—	—	10	15	15
U.S.S.R.	20	—	—	—	20	—	—	—	20	20	20	20	20
EAST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	10/15	10/15	20

* Try next higher band on G days (1) Possible opening on this band on G days (2) Try 80m
Note A Use values of 10/15 for 12m, 20 for 17m, 40 for 30m. Note B This chart refers to the highest band possible at the time indicated. If no luck, try next lower band

MARCH 1991

SUN	MON	TUE	WED	THU	FRI	SAT
					1 G	2 F
3 F–G	4 G	5 G	6 G	7 G	8 G–F	9 F
10 F–P	11 P	12 P–F	13 F–G	14 G	15 G	16 G
17 G–F	18 F	19 F–P	20 F–P	21 F–P	22 F–P	23 P
24 P–F	25 P–F	26 P–F	27 P–F	28 F–G	29 G	30 G
31 G						

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Case Size: 2.2(W)x6.0(H)x1.3(D)in.

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